FAA Safety BRIEFING

May/June 2014

Your source for general aviation news and information

Leveraging Certification and Standards to Avoid Monstrous Maintenance Mistakes

Growing Old Gracefully

Beware the Frankenplane!

All About ADs!

Federal Aviation Administration

faa.gov/news/safety_briefing
@FAASafetyBrief

FAA Safety BRIEFING

May/June 2014

Your source for general aviation news and information

Leveraging Certification and Standards to Avoid Monstrous Maintenance Mistakes

Growing Old Gracefully

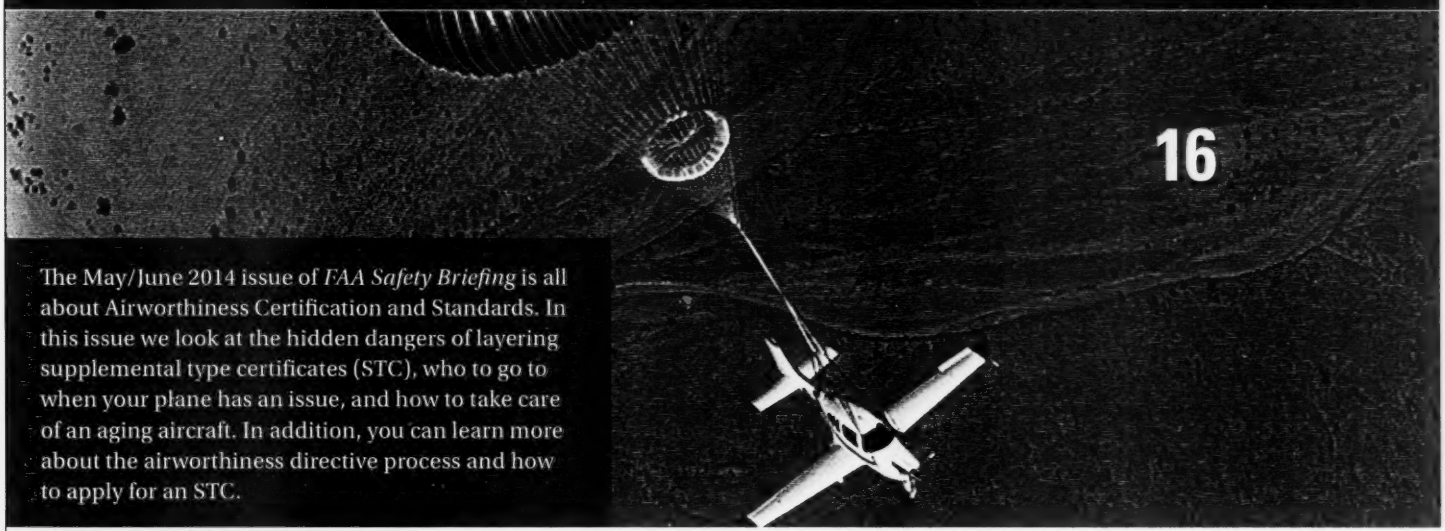
Beware the Frankenplane!

All About ADs!

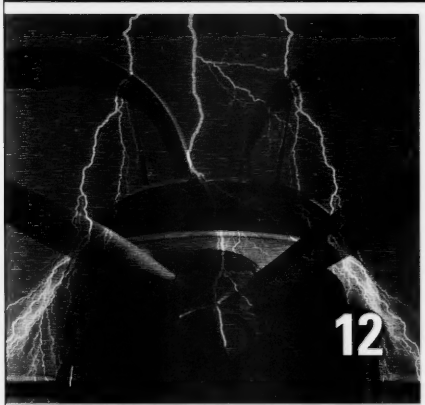
Federal Aviation Administration

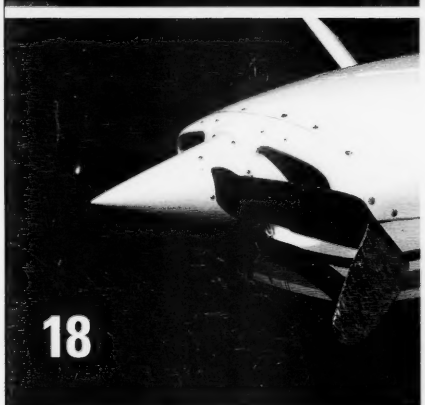
faa.gov/news/safety_briefing
@FAASafetyBrief

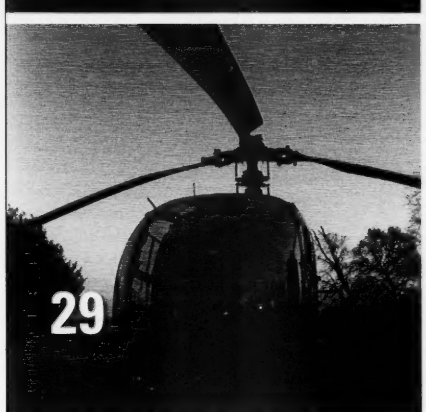
FAA Safety Briefing is the FAA safety policy voice of non-commercial general aviation.



The May/June 2014 issue of *FAA Safety Briefing* is all about Airworthiness Certification and Standards. In this issue we look at the hidden dangers of layering supplemental type certificates (STC), who to go to when your plane has an issue, and how to take care of an aging aircraft. In addition, you can learn more about the airworthiness directive process and how to apply for an STC.







Features

8 **Growing Old Gracefully** "Senior" Care for Aging Airplanes
by Tom Hoffmann

12 **Beware the Frankenplane!**
Leveraging Certification and Standards to Avoid Monstrous Maintenance Mistakes
by Sabrina Woods

16 **If Clyde and Walter Had Only Known**
How STCs are Handling the Growing Changes in Aviation Design
by Barry Ballenger

18 **The "Doctor" is In** A Short Guide to Who Should Fix Your Plane
by Sabrina Woods

22 **All About ADs!** And How You Can Get Involved
by David Showers

25 **AOA:** More Than Just a Display
by Dave Sizoo

Departments

1 **Jumpseat** – an executive policy perspective

2 **ATIS** – GA news and current events

5 **Aeromedical Advisory** – a checkup on all things aeromedical

7 **Ask Medical Certification** – Q&A on medical certification issues

21 **Checklist** – FAA resources and safety reminders

27 **Nuts, Bolts, and Electrons** – GA maintenance issues

28 **Angle of Attack** – GA safety strategies

29 **Vertically Speaking** – safety issues for rotorcraft pilots

31 **Flight Forum** – letters from the Safety Briefing mailbag

32 **Postflight** – an editor's perspective

Inside back cover **FAA Faces** – FAA employee profile

JOHN DUNCAN
DIRECTOR, FLIGHT STANDARDS SERVICE

The Mastery of Mechanics

I always enjoy the opportunity to leave the confines of my office and go "beyond the Beltway," as we say, to meet with field-based Flight Standards Service employees and the airmen we serve around the country. Although a late season snowstorm in Washington truncated a multi-city trip I was scheduled to make, I was still able to get to Phoenix for meetings with Filght Standards Service (AFS) employees and aviation groups there. (Yes, I know. Phoenix in March is tough duty. But someone has to do it, right?)

One of my stops in Phoenix was a visit to the eighteenth annual Aircraft Maintenance Symposium sponsored by the Chandler-Gilbert Community College Aviation and Technology Center, in partnership with the Flight Standards District Office in Scottsdale. I'm very proud of our involvement in this event, which — as the website notes — "targets quality educational needs, provides opportunities for networking with the southwest aviation community, and (offers) up-to-date product improvement information."

Anyone who operates an aircraft, and especially anyone who owns an aircraft, will also appreciate how such events provide training to address current maintenance issues and provide credit toward renewal of Inspection Authorization (IA) certification and points for the Aviation Maintenance Technicians (AMT) Award. I personally am especially mindful of how important AMTs are right now, because at the time of this writing, my Piper *Cherokee* is in the capable hands of the Airframe & Powerplant/Inspection Authorization (A&P/IA) mechanic who is conducting its annual inspection. And, yes, like every other aircraft owner I know, I am fervently hoping my airplane will get a clean bill of health from the technician without requiring a large denomination bill from my wallet.

Master Mechanics

Given the importance of AMTs, a highlight of my time at the Aircraft Maintenance Symposium was having the honor and privilege of presenting the Charles Taylor Master Mechanic Awards to several very deserving individuals. Most pilots are familiar with the Wright Brothers Master Pilot Award, which goes to pilots with an accident-free half-century flying record. No less important is this prestigious award. Named in honor of the first aviation mechanic in powered flight, the Charles Taylor Master Mechanic Award recognizes the lifetime accomplishments of senior mechanics. It is fitting that this award bears Mr. Taylor's name, because he served as the Wright brothers' mechanic. Among other things, he is credited with designing and building the engine for Orville and Wilbur's first successful aircraft.

Since aircraft certification and maintenance is the focus of this issue of *FAA Safety Briefing* magazine, it is fitting to offer a reminder of what it takes for a mechanic to earn the Charles Taylor Master Mechanic award. To be eligible, the candidate must be a U.S. citizen who has worked consecutively or non-consecutively in an aviation maintenance career for a period of 50 years. He or she must have been an FAA-certificated mechanic or repairman working on N-registered aircraft maintained under the requirements of Title 14 Code of Federal Regulations for at least 30 of the 50 total years required. The remaining 20 years may be accepted if that individual served as an aircraft mechanic/repairman in the U.S. military, worked as an uncertificated person in a U.S. aviation maintenance facility that maintained U.S.-registered aircraft, or worked as an uncertificated person in the U.S. aircraft manufacturing industry.

Named in honor of the first aviation mechanic in powered flight, the Charles Taylor Master Mechanic Award recognizes the lifetime accomplishments of senior mechanics.

Congratulations to all who have earned this award! And, if you happen to know an AMT who might be eligible, please encourage him or her to check the criteria on www.faasafety.gov and apply. I enjoy giving awards, and I'll be eager to see your favorite AMT on the next round.

Learn More

Charles Taylor Master Mechanic Award Information
https://faasafety.gov/MasterMechanic

New Rule Improves Helicopter Safety

Helicopter operators, including air ambulances, now have stricter flight rules and procedures, improved communications, training, and additional on-board safety equipment requirements. These changes represent the most significant improvements to helicopter safety in decades and responds to government's and industry's concern over continued risk in helicopter operations.

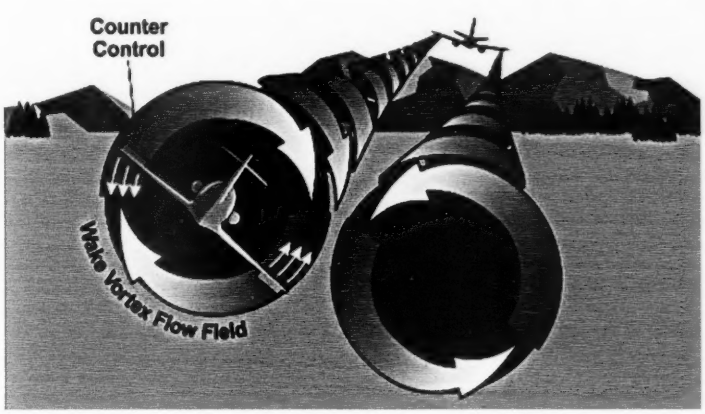
Under a new rule, all Part 135 helicopter operators are required to:

- Equip their helicopters with radio altimeters;
- Have occupants wear life preservers and equip helicopters with a 406 MHz emergency locator transmitter (ELT) when a helicopter is operated beyond power-off glide distance from the shore;
- Use higher weather minimums when identifying an alternate airport in a flight plan; and
- Require that pilots are tested to handle flat-light, whiteout, and brownout conditions and demonstrate competency in recovery from an inadvertent encounter with instrument meteorological conditions.

Go to http://1.usa.gov/1jMc6Fq for more information and to read the FAA final rule on helicopter air ambulance, commercial helicopter, and Part 91 helicopter operations.

Aircraft Wake Turbulence AC Update

Advisory Circular (AC) 90-23G has been revised. It presents basic information about wake vortex behavior, alerts pilots to the hazards of aircraft wake turbulence, and recommends operational procedures to avoid wake turbulence encounters. Download the AC at http://1.usa.gov/Oen640.



Two Cessna Safety Alerts

A special airworthiness information bulletin (SAIB) has been issued to alert owners, operators, and maintenance technicians of Cessna 300 and 400 models and series airplanes of an airworthiness concern. The FAA recommends inspecting the nose landing gear trunnion to ensure that cracks are not present. If cracks are present, the trunnion should be replaced because a failure during landing may cause significant damage to the airplane and may cause injury to the occupants. This affects all series of Cessna models 310, 335, 340, 401, 402, 404, 411, 414, 421, 425, and 441, and Reims 406 airplanes. Download the SAIB at http://1.usa.gov/1nBMptA.

Door Co. Sheriff's Office

Also, a new Airworthiness Directive (AD) has been issued to correct an unsafe condition for Cessna models 310, 320, 340, 401, 402, 411, 414, and 421 airplanes. The AD was prompted by an investigation of recent and historical icing-related accidents and incidents. These airplanes are now required to have the supplemental airplane flight manual/airplane flight manual supplement inside the airplane and accessible to the pilot during the airplane's operation. Another option is to install a placard that prohibits flight into known icing conditions and a

second placard that increases published airspeed on approach at least 17 mph (15 knots) in case of an inadvertent encounter with icing. Download the AD at http://1.usa.gov/1kbFrKq.

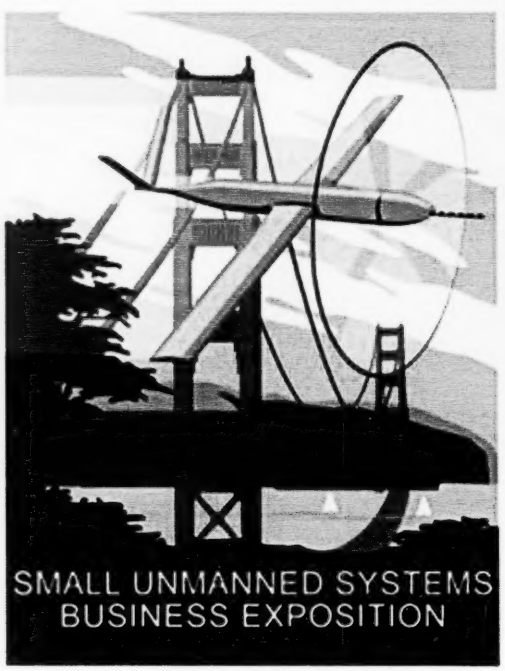
Letters to Airmen Go Digital

Pilots are now able to view letters to airmen (LTAs) and notices to airmen (NOTAMs) online through the NOTAM Search tool at http://1.usa.gov/1cKdI3J. It integrates LTAs on a single web based platform.

LTAs are issued by terminal control facilities and air route traffic control centers to publicize new or revised services, anticipated interruptions of service, procedural changes, and other items of interest to users. Moving to an electronic distribution of LTAs significantly simplifies and automates the process and enhances safety by providing pilots information more quickly.

Small Unmanned Aircraft Myths

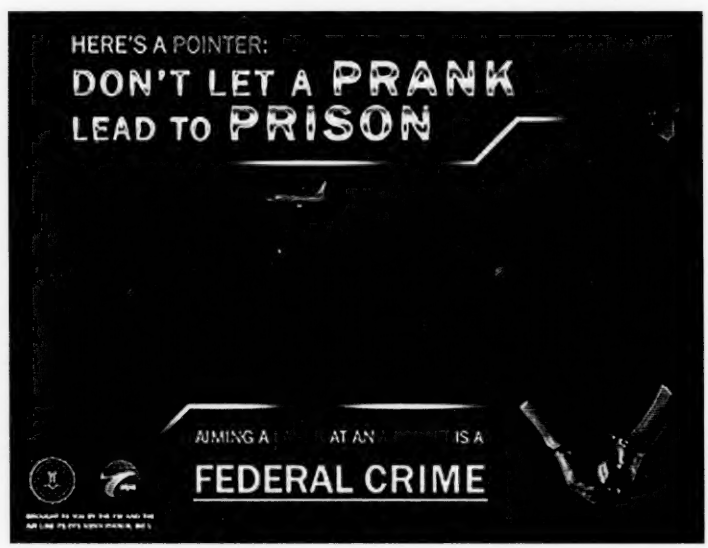
Unmanned aircraft, regardless of whether the operation is for recreational, hobby, business, or commercial purposes, are aircraft as defined by the law. The FAA is also responsible for air safety from the ground up. There are a lot of misconceptions and misinformation about unmanned aircraft system (UAS) regulations so a fact sheet has been published at http://1.usa.gov/1lqMy1B to dispel common myths along with the corresponding facts.



You can catch up with what's happening with airspace integration at the Small Unmanned Systems Business Exposition (*sUSB-Expo)* in San Francisco May 8-9. Jim Williams, the manager of FAA's Unmanned Aircraft Systems Integration Office, will be speaking. The office is the single agency focal point for all UAS-related activities and is uniquely positioned to develop and coordinate solutions to UAS challenges across the FAA and with external organizations. Go to http://susbexpo.com for more information.

Protecting Aircraft from Lasers

The FBI will offer up to $10,000 for information leading to the arrest of any individual who intentionally aims a laser at an aircraft. The bureau's new program is aimed at deterring people from pointing lasers at aircraft, which is a felony punishable by five years in jail. If you see someone pointing a laser at an aircraft, you may call 911 immediately to report the incident. For more information and to watch an FBI simulation that shows the dangers of pointing a laser at an aircraft, go to http://1.usa.gov/1h854xJ.



GA Awards Deadline

It's not too late to nominate that outstanding flight instructor, aviation maintenance technician, avionics technician, or FAA Safety Team (FAASTeam) representative for the 2015 General Aviation Awards Program. The program

U.S. Department
of Transportation

**Federal Aviation
Administration**

ISSN: 1057-9648
FAA Safety Briefing
May/June 2014
Volume 53/Number 3

Anthony R. Foxx *Secretary of Transportation*
Michael P. Huerta *Administrator*
Margaret Gilligan *Associate Administrator for Aviation Safety*
John Duncan *Director, Flight Standards Service*
James Viola *Manager, General Aviation and Commercial Division*
Susan Parson *Editor*
Tom Hoffmann *Managing Editor*
James Williams *Associate Editor / Photo Editor*
Sabrina Woods *Assistant Editor*
Paul Cianciolo *Assistant Editor*
John Mitrione *Art Director*

Published six times a year, *FAA Safety Briefing*, formerly *FAA Aviation News*, promotes aviation safety by discussing current technical, regulatory, and procedural aspects affecting the safe operation and maintenance of aircraft. Although based on current FAA policy and rule interpretations, all material is advisory or informational in nature and should not be construed to have regulatory effect. Certain details of accidents described herein may have been altered to protect the privacy of those involved.

The FAA does not officially endorse any goods, services, materials, or products of manufacturers that may be referred to in an article. All brands, product names, company names, trademarks, and service marks are the properties of their respective owners. All rights reserved.

The Office of Management and Budget has approved the use of public funds for printing *FAA Safety Briefing*.

CONTACT INFORMATION

The magazine is available on the Internet at:
http://www.faa.gov/news/safety_briefing

Comments or questions should be directed to the staff by:

- Emailing: SafetyBriefing@faa.gov
- Writing: Editor, *FAA Safety Briefing*, Federal Aviation Administration, AFS-805, 800 Independence Avenue, SW, Washington, DC 20591
- Calling: (202) 385-9600
- Twitter: @FAASafetyBrief

SUBSCRIPTION INFORMATION

The Superintendent of Documents, U.S. Government Printing Office, sells *FAA Safety Briefing* on subscription and mails up to four renewal notices.

For New Orders: Subscribe via the Internet at http://bookstore.gpo.gov, telephone (202) 512-1800 or toll-free 1-866-512-1800, or use the self-mailer form in the center of this magazine and send to Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9371.

Subscription Problems/Change of Address: Send your mailing label with your comments/request to Superintendent of Documents, U.S. Government Printing Office, Contact Center, Washington, DC 20408-9375. You can also call (202) 512-1800 or 1-866-512-1800 and ask for Customer Service, or fax your information to (202) 512-2104.

aims to recognize aviation professionals on a local, regional, and national level for their excellence and long-term contributions to GA and flight safety. Nominations are being accepted from July 1 through Sept. 30. Go to www.generalaviationawards.org for more information.

Steady Growth in Air Travel

The FAA Aerospace Forecast Fiscal Years 2014 shows the nation's aviation system will continue to grow over the next two decades with a greater number of people expected to fly more miles each year. To help the FAA and the aerospace system better prepare for the forecasted growth and future changes in the industry, Administrator Michael Huerta has outlined four key strategic initiatives to meet America's growing reliance on air travel. The initiatives are:

- Raising the bar on safety by proactively using safety management principles to make smarter, risk-based decisions throughout the agency and with industry and global stakeholders.
- Rebalancing existing services and modernizing our infrastructure including advancing NextGen, to reduce costs and become more efficient in the long run, as we safely integrate new types of users into the nation's airspace.
- Building on America's history of leadership in shaping international standards to continue to improve aviation safety and efficiency around the world.
- Attracting and developing the best and the brightest talent with the appropriate leadership and technical skills to undertake the transformation of America's national aviation system.

For more information, go to http://1.usa.gov/1cWrlY6.

New Helicopter Safety App

The United States Helicopter Safety Team (USHST), which is made up of U.S. government and industry leaders to address the factors affecting the civil helicopter accident rate, has released a new app called *I Fly Safe*. The app offers helicopter pilots and operators access to a library of the latest safety bulletins, fact sheets, videos, and a link back to the recently updated www.ushst.org.

For Android:
http://bit.ly/1itPoWh

For iPad:
http://bitly.com/1el1MjT

For iPhone:
http://bitly.com/1g1vo5k

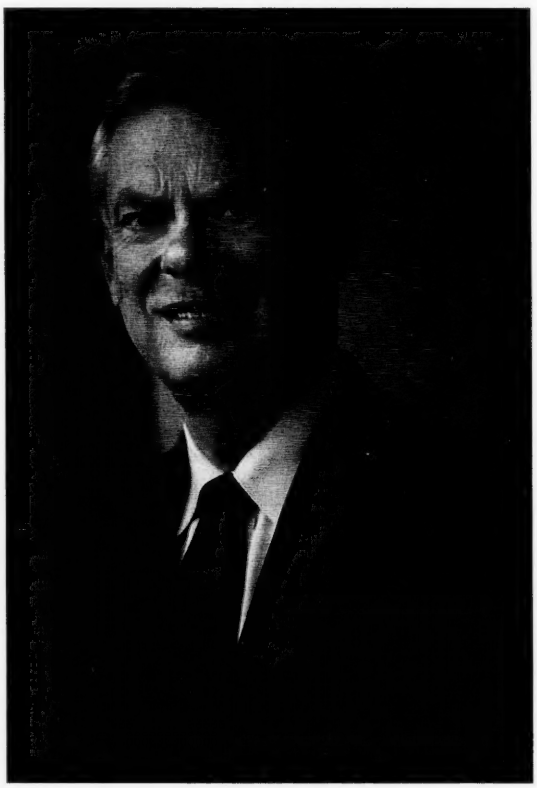
JAMES FRASER, M.D
FEDERAL AIR SURGEON

Empowering that Last Ten Percent

Today, ninety percent of all airmen are able to walk into an AME's office and walk out with a new medical certificate. Not surprisingly, those airmen are the ones most happy with our current system. While it's not perfect, the system works as intended for that ninety percent. In fact, many consider it to be the "gold standard" of aerospace medical certification. Even so, my job is to try and improve our system from a user experience standpoint. As my predecessor, Dr. Fred Tilton, used to say, "our primary mission is to keep the National Airspace System (NAS) safe. But after that, I want to work to get as many airmen into the air as is safely possible." I intend to follow his example.

My Story

My journey to aerospace medicine began as a family practice physician in the Navy. While I thoroughly enjoyed family practice — to include my time serving as family practice teaching staff and as Officer in Charge of Naval medical clinics in the Philippines and Scotland — I had always wanted to be a Naval Flight Surgeon. So in 1989 I began training as a Naval Flight Surgeon and the Navy taught me to fly an airplane. I have been in aerospace medicine ever since. Following basic Flight Surgeon training, the Navy gave me an opportunity to complete a second residency in aerospace medicine. I then served as the Senior Medical Officer for the aircraft carrier U.S.S. Theodore Roosevelt (CVN-71). In terms of medical care, that put me in charge of virtually a "city at sea." With a medical staff of 62 and a 67 bed hospital, I was responsible for not only the 6,000 men and women aboard the Roosevelt, but also for up to 12,000 people in the carrier battle group when we were deployed. I subsequently served as the Force Medical Officer for the Commander, Naval Air Force, Atlantic Fleet. Here I was responsible for the medical departments for all East Coast aircraft carriers, as well as for 18 Naval Air Station medical clinics and more than 100 physicians In my last tour in the Navy, I served as the Command Surgeon at the Naval Safety Center. Here I had the opportunity to participate in the training and oversight of all Naval Flight Surgeons I also had the opportunity to work with the highest levels of Naval Aviation on significant safety initiatives and served on the Space Shuttle Columbia Accident Investigation Board. I retired as a Captain



(06) after 30 years of service. I believe my training and experience in the Navy prepared me well for my present duties and responsibilities and I would do it again in a heartbeat. I've now been with the FAA for 10 years, eight of which I have served as Deputy Federal Air Surgeon.

My Goal

Now that you know a little bit about my past experience I'd like to share my goal for the future of the FAA's Office of Aerospace Medicine. My goal is to make interfacing with medical certification a little more efficient, friendlier, and, overall all, a more pleasant experience for airmen. Two tools can be very effective in leveraging the incredible knowledge and experience of our AMEs, thereby achieving this goal. Ultimately, I'd like to cut that ten percent of remaining applicants who have to take a longer path to obtaining medical certification down to eight, or even five percent. Here's how we're going to start that process.

Conditions AMEs Can Issue (CACI)

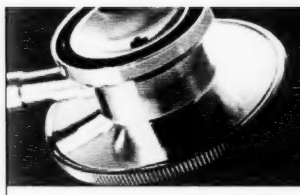
CACI is the first tool that can help us work toward our shared goal. As the name suggests, CACI is a process by which AMEs can issue a regular issuance medical certificate for conditions that formerly required deferral to FAA's Aeromedical Certification Division (AMCD), or were even entirely disqualifying. If the applicant can meet the parameters of the provided worksheet and is otherwise qualified, the AME is allowed to issue a medical certificate during the office visit without consulting the AMCD. Qualifying conditions include arthritis, colitis, migraine headaches, and others. Over time we'd like to increase the number of conditions that qualify for CACI, and thus expand the number of airmen who can walk out of the AME's office with a medical certificate in hand.

AME Assisted Special Issuance (AASI)

For those we can't help with CACI, we are looking to expand the use of AASI. This is a process where we can take advantage of our AMEs to expedite the process of renewing a special issuance. If you have a condition that requires a special issuance on the first certification, after the diagnosis your application will have to be deferred to AMCD or the Regional Flight Surgeon (RFS). But on your return visit to renew your Special Issuance, all you need to do is provide certain additional information at the time of your exam and the AME may provide the Special Issuance without having to again defer to the AMCD or Regional Flight Surgeon. Qualifying conditions include: Atrial fibrillation, type II diabetes, many of the cancers, obstructive sleep apnea and many others. While AASI doesn't help with your initial exam, it does make staying medically cleared a lot easier and quicker.

These are the first steps I propose to take on that last ten percent, while still upholding the safety of our NAS. My goal is to leverage our skilled AMEs to make the process friendlier and more efficient for you, the applicant. As these and other changes are made please, let us know how we're doing on this goal. Thanks for reading!

Dr. James Fraser is the new Federal Air Surgeon. He replaces Dr. Fred Tilton, who retired in January 2014.



Ask Medical Certification

COURTNEY SCOTT, D.O.
MANAGER, AEROSPACE MEDICAL
CERTIFICATION DIVISION

Q1. I have a question about an answer in the July/August 2013 issue of *FAA Safety Briefing* regarding hypertension. Dr. Scott advised the writer, who had a blood pressure reading of 150/90, which is not FAA disqualifying, to advise the AME at his next FAA medical exam of his previous blood pressure reading. I was wondering why one would do this if 150/90 is not disqualifying. I am concerned because I have heard of a phenomenon called "white coat hypertension" where an erroneous reading is caused by the anxiety of being in a doctor's office. What do you think of this?

A1. "White coat hypertension" does indeed exist. However, if one is consistently having blood pressure readings in the 150/90 range, from a clinical perspective treatment may be indicated. It is the responsibility of your treating physician to determine if this reading is accurate. We expect the airman to always be truthful and open in disclosing medical information to the AME. There is little to be gained from trying to "hide" the reading of 150/90 when it can likely be easily explained and, as the reader notes, is not disqualifying in any case.

Q2. I am 75 years old and have high PSA readings. I have chosen not to take any action (including a biopsy) based on a lot of current information. My medical is renewable every year if I get a letter from my doctor stating we are closely monitoring the situation. I understand you may no longer require this. What's the current status on this?

A2. Recently, the certification policy has changed such that if an airman has prostate cancer, confined to the gland itself, the AME can review the information from the treating physician and may issue the medical certificate without special issuance as long as certain parameters are met. An elevated PSA may indicate prostate cancer, but there are also other conditions which may cause the elevated PSA. Because you do not have a specific diagnosis with defined treatment goals, the elevated PSA will need to continue to be followed in accordance with what you are doing currently. Please understand, I am not criticizing what you are doing; we simply do not have the information we would need to discontinue monitoring from an aeromedical perspective.

Q3. In your Nov/Dec issue of *FAA Safety Briefing* there was a comment made in "Ask Medical Certification" that piqued my interest. The author wrote that regarding skin cancer, "some skin cancers, specifically melanoma and sometimes squamous cell, may be very hazardous to aviation." Having been in the medical field for nearly 30 years, I have never heard of this before and was interested in the reason for this statement.

A3. Melanoma is notorious for distant metastatic disease. Not infrequently, the cancer moves to the brain. This is obviously hazardous to aviation as it may present with seizure, behavioral changes, cognitive deficits, or other neurologic changes. Advanced squamous cell cancers may also metastasize or have extensive local involvement that can cause problems. Our Federal Air Surgeon Oncology Consultants help us monitor advanced cancers for the reasons mentioned.

Send your questions to SafetyBriefing@faa.gov. We'll forward them to the Aerospace Medical Certification Division without your name and publish the answer in an upcoming issue.

Q4. If a pilot got poked in the eye while cutting some firewood and he couldn't see very well with his cornea scratched so he self-disqualified, can he re-certify himself for flight when his eye heals?

A4. This would be considered a self-limiting injury provided that the visual acuities and fields are all normal after the injury. Normally, they would be, but if there is any question, the airman should seek consultation with an Aviation Medical Examiner or their treating eye physician.

Courtney Scott, D.O., M.P.H., is the Manager of Aerospace Medical Certification Division in Oklahoma City, Okla. He is board certified in aerospace medicine and has extensive practice experience in civilian and both military and non-military government settings.

TOM HOFFMANN

Growing Old Gracefully

"Senior" Care for Aging Airplanes

You know your plane is getting old when:

1. Your marquee avionics component is an ADF
2. The tiny foreign flags painted on the side aren't a homage to your heritage
3. You remember flying it for a $25 hamburger
4. Your owner's manual was published the same year as *Catcher in the Rye*
5. You have a "blip switch" to control your taxi speed

While the list above might elicit a chuckle, aging aircraft problems are a stark reality for an increasing number of aircraft owners.

Comedian George Burns once said, "If I'd known I was going to live this long, I'd have taken better care of myself." Burns, who lived to be over 100, also quipped, "You can't help getting older, but you don't have to get *old*."

Both of these quotes can resonate with aging aircraft owners. In aviation's early days, few aircraft manufacturers imagined a period of usefulness that would exceed 20 or 30 years for new aircraft rolling off the line — let alone 40, 50, or even 60 years! But as we've seen in the general aviation industry, that type of longevity is more and more common. It stands as a tribute to sound construction and design standards, as well as proactive maintenance practices.

Getting Started

Preparing your aircraft for its "golden years" requires a keen understanding of what can cause aging-related issues in the first place. And, given that 40 is now the average age for more than two-thirds of aircraft in the GA fleet, staying ahead of this aging curve has never been more important.

"There are several factors that can affect when, where, why, and how an aircraft shows signs of aging," says Marty Bailey, manager of the National FAASTeam's Airworthiness Branch of the FAA's Aircraft Maintenance Division. "Everything from environmental factors — like what type of climate an aircraft operates in, to how an aircraft is used — like banner towing or flight instruction, can affect the aging process."

As the GA fleet continues to age, more owners are understandably concerned about whether an

airplane designed prior to life limit requirements will somehow exceed its useful life expectancy. Many GA aircraft were designed under Civil Aviation Regulations (CAR) part 3, which did not mandate service life limit requirements. Even with newer aircraft, many pilots are concerned with how aging can affect more modern construction materials and methods.

To address these issues, the FAA, along with industry, has invested considerable time and resources studying various aging factors that can impact aircraft over time. As a result, much has been discovered about corrosion, fatigue, and inspection techniques — the key factors for mitigating the effects of aging in general aviation aircraft.

So How Old is Too Old?

There might be a few more of the figurative gray hairs and wrinkles on the average aircraft these days, but according to safety records, the GA fleet shows no evidence of any systemic safety issues. Solid design and construction characteristics are a major factor in the longevity of these aircraft. But that can also be a rationale for complacency.

Inspection processes are a good example where this complacency can creep in. Although there is no requirement for an annual inspection to be any different for an aircraft that's 40 years old, it doesn't necessarily mean a 40-year-old plane should get the same type of inspection. Certain areas that aren't required to be checked should still be inspected. Owners and mechanics should ensure that inspections include *all* areas of the aircraft, not just the ones that are easy to reach and labeled on a checklist.

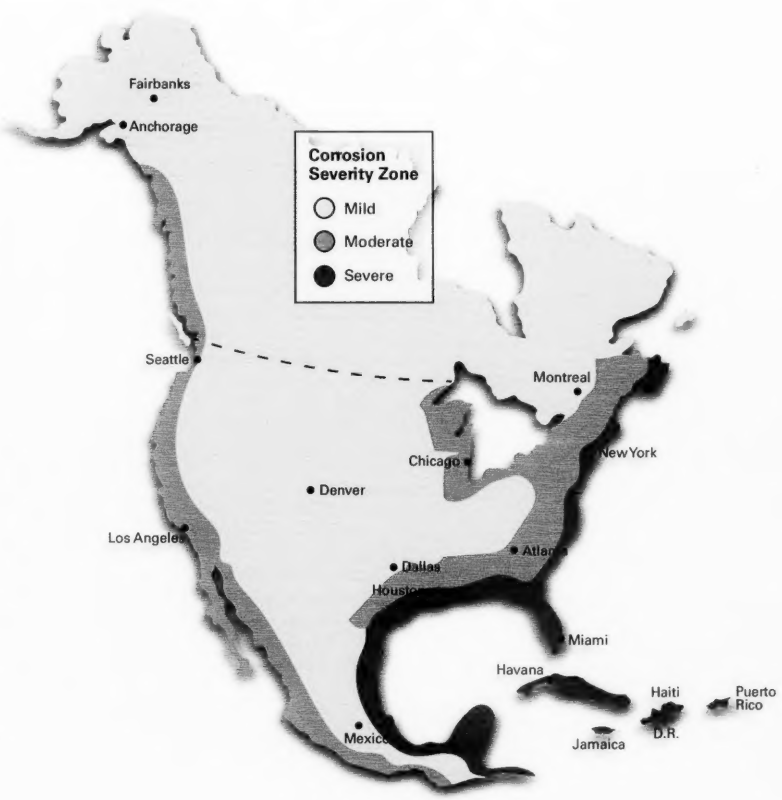
Also keep in mind that as an airplane ages, the inspection methods and techniques may change and require "special attention" inspections. These special inspections, focused on areas prone to aging problems, become even more critical when an aircraft is subjected to conditions like outdoor storage, inactivity, or modifications. If applicable, be sure to expand your normal inspection checklists to include these special attention items. For assistance, recruit help from the manufacturer, a mechanic, or a type club, and be sure to reference Advisory Circular (AC) 20-106, *Aircraft Inspection for General Aviation Aircraft Owner*. There's also a good baseline checklist at the back of the *Best Practices Guide for Maintaining Aging General Aviation Airplanes* (see link at the end).

A Corrosive Mix

Corrosion — the degradation of metals from a chemical reaction — is probably the most visible effect aging can have on an aircraft. Knowing what causes it and what corrosion looks like on different parts of your aircraft will help you identify, treat, and prevent it from doing further damage.

Many airframe structures use high-strength aluminum alloy coated with a corrosion-resistant pure aluminum coating (alclad). However, when you introduce airborne salts and pollutants along with moisture, the alclad can break down, resulting in the deterioration of the aluminum alloy below it. Protective primer is another method used to mitigate corrosion, however, it too is not a permanent protection. Corrosion on aluminum parts will generally appear like a crusty white or gray powder and can be removed by mechanical polishing or brushing with materials softer than the metal.

Another common material in aircraft construction is steel, which exhibits the familiar reddish brown rust when corrosion is present. Corrosion on steel can be controlled by removing it mechanically and by maintaining its protective coating (usually a cadmium or zinc plating).



Areas of where corrosion is likely to occur

Your chances of having corrosion are also highly dependent on where an aircraft is flown and stored. For example, owners who operate or store their aircraft in the warm, humid conditions found in coastal states like Florida or Louisiana need to keep a more watchful eye for corrosion. Take a look at the map on page 9 to see areas in North America where corrosion is most likely to occur. For detailed photos on corrosion types and control methods, have a look at AC 43-4A, *Corrosion Control for Aircraft.*

Cracks Kill

Another leading factor in aging aircraft issues — fatigue — can be a lot harder to detect. While many GA aircraft owners are not overly worried about the punishing stress of pressurization common to air carrier operations, there are many other causes of fatigue germane to GA. These include wind gusts, unpaved runways, and yes, the occasional student pilot. If left unchecked, these damaging forces can have deadly consequences.

Certain parts and components like engine supports, or wing spar attachment fittings can become fatigue hot spots. The key here is to know the hot spots specific to your aircraft and to keep these areas thoroughly inspected. A good way of doing this is to stay on top of pertinent FAA and manufacturer-based notices, like ADs, SAIBs, and service bulletins. Type clubs can also help keep you in the loop.

The effects of fatigue are also cumulative, meaning airplanes can't heal from being stressed. And since fatigue is based on load, which is not necessarily related to age, even owners of newer aircraft need to be vigilant and proactive in their inspections.

Get Some Knowledge

It's also a good idea to have detailed information about your aircraft's history as aging issues aren't limited to the number of years or flight hours an aircraft has accumulated. Among the questions you should ask during your research are: Where has the aircraft been geographically? Has it been hangared? Was it flown in any special or severe usage capacity? If that information proves hard to come by, try looking at some of the aircraft's maintenance records. You might find that it once had floats, or belonged to a flight school. The address of the owner or the repair facility should also provide clues to its whereabouts and the climates it has been exposed to.

Australia's Civil Aviation Safety Authority (CASA) is currently developing a program that will help with some of this time-consuming sleuth work. Last year CASA began testing a new prototype risk matrix tool for GA aircraft that helps owners see the likelihood of their aircraft being impacted by aging issues. An aircraft owner simply plugs in their aircraft type, serial number, and whatever additional background information he or she can provide. That information will be combined with existing information from CASA databases to provide owners with a color-coded risk assessment score. The FAA will be monitoring the success of the program to see if a similar type tool

would be beneficial here in the United States. (For more information on CASA's aging aircraft program, go to www.casa.gov.au/ageingaircraft.)

An important information gathering tool that the FAA already has at its disposal is the Service Difficulty Report (SDR) system. This massive public database contains thousands of aviation maintenance and service problem reports submitted directly by aircraft owners and mechanics. And soon the FAA will be rolling out an exciting new system called Aviation Data Exchange, or AVDEX, that may eventually take the place of SDR. This system will be simpler to use, more engaging, and will provide a real-time reporting environment with instant feedback and data availability.

"We are pushing for a cloud-based system that accepts data from all kinds of sources, including SDR," says Barry Ballenger, an aerospace engineer at the FAA's Small Airplane Directorate. "We're providing anytime, anywhere data availability using technology people already use, including smartphones, tablets, and laptops. And with AVDEX, instead of aircraft owners having to seek out and pull in information, the system will push this information directly to the user."

Having a system with this level of scalability, together with real time data processing, will also help the FAA to better spot trends and be more proactive in addressing potential unsafe conditions. AVDEX is in a concept refinement stage now, but stay tuned for more information soon.

Use It or Lose It

Another factor worthy of researching is how *much* an aircraft has been used. While it is true that special uses like moving heavy loads, low altitude flying, or flight instruction can exacerbate the effects of aging, certain areas of an aircraft can develop problems from being underutilized.

Regular flying keeps the engine parts lubricated and aircraft system components working as intended. In contrast, an aircraft sitting idle on a ramp may have components that deteriorate and age faster than those on a similar aircraft that sees a fair amount of routine flying. Sounds like a good excuse to get out and fly!

Tools You Can Use

As you can see, there are a great many details to master when it comes to aircraft aging. Thankfully, there are tons of resources and tools you can use to help you become better educated on how to properly care for older aircraft. But if you prefer one-stop shopping, the FAA-sponsored website (www.aginggeneralaviation.org) provides a single access point to type-specific aging aircraft maintenance information. In addition to providing an extensive list of aging-related documents, training curricula, type club information, and database links, the site also features a "War Stories" section where viewers can read, or even add a personal account of an aging-related aircraft incident.

To sum up, there's no silver bullet when it comes aircraft aging problems. The best you can do is to learn as much as you can about your aircraft. Know where it's been, keep it maintained well, and never stop assessing the need for additional inspections.

To paraphrase the earlier quote from Burns, aging is inevitable, but with the proper tools and the right mindset, it doesn't have to get the best of you. Now say goodnight Gracie!

Test Your Knowledge

What type of corrosion appears as a worm-like pattern beneath a paint or organic film?

A. Pitting corrosion
B. Filiform corrosion
C. Intergranular corrosion

Answer: B

Tom Hoffmann is associate editor of FAA Safety Briefing. *He is a commercial pilot and holds an A&P certificate.*

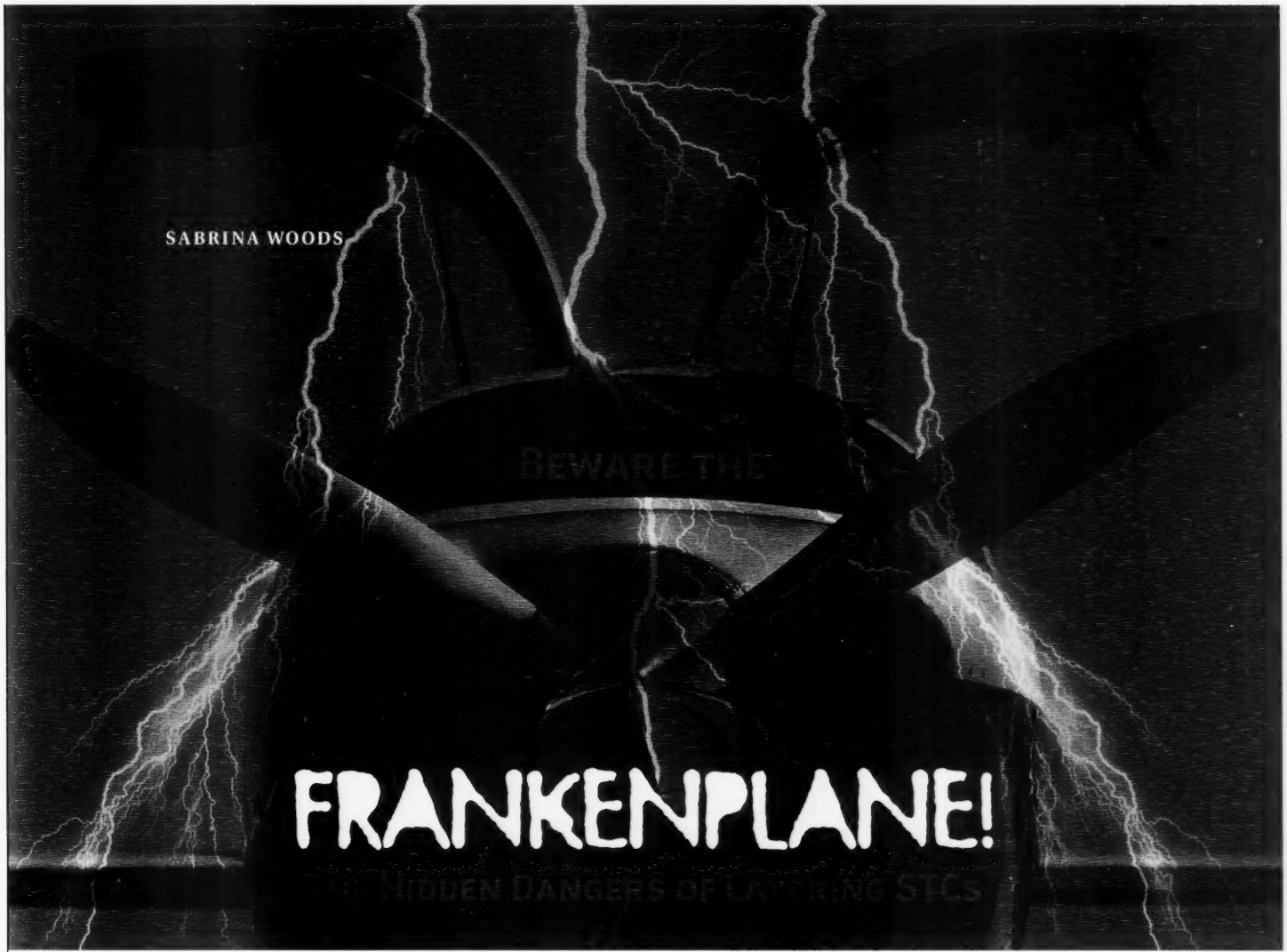
For More Information

Best Practices Guide to Aging GA Aircraft
http://1.usa.gov/1gPJhV0

FAA's Service Difficulty Reporting Site
http://av-info.faa.gov/sdrx/

FAA Advisory Circular (AC) 43.13-1B, Acceptable Methods, Techniques, and Practices - Aircraft Inspection and Repair
http://1.usa.gov/OJFWjq

AOPA/Air Safety Institute Online Course for Aging GA Aircraft
http://bit.ly/1hvKGpU



Whether you have read Mary Shelley's dark foray into the world of science fiction, or if you are only acquainted with the 1931 Boris Karloff horror classic, the tale of The Modern Prometheus — better known as *Frankenstein* — is as iconic as it is timeless. "It's alive!" Colin Clive as Dr. Frankenstein exclaims in the movie as "the creation" (Karloff) slowly stirs upon the laboratory table. Ecstatic, exuberant, unrepentant and proud, Dr. Frankenstein never really stops to consider the consequences of his actions. Unfortunately it is also the last "feel good" moment in either the text or the picture as it kind of all goes awry from there. What does any of this have to do with general aviation you might ask? Sadly, quite a bit.

The Hidden Risk

"Dangerous? Have you never wanted to do anything that was dangerous? Where should we be if no one tried to find out what lies beyond?" – Dr. Frankenstein (movie)

- A Cessna P210 impacts the ground in an aerodynamic spin. Witnesses observed the airplane in a spin and near-vertical trajectory just prior to impact. Post-accident examination revealed the plane's aerodynamic configuration and weight distribution were significantly modified via several supplemental type certificates (STCs).
- A tailwheel-equipped Cessna 170A touched down in a three-point landing, immediately veered sharp left, exited the runway and careened into a ditch. A review of the logbooks indicated four recent major airframe modifications including STCs for a main landing gear (MLG) reinforcement kit, replacement of MLG components with ones from a Cessna 180, replacement of stock tires, and replacement of a stock tailwheel spring with one from a Cessna L19 *Bird Dog*.
- A Bell UH-1H experienced structural failure in the tail boom while hovering near a cliff

about 200 feet off the ground. A post-landing examination revealed the left tail boom upper attachment fitting was fractured. Previously, the helicopter had been modified with numerous STCs that included an upgraded engine, installation of the FastFin system, strakes and composite tail rotor blades, as well as an upper skin replacement.

What these incidents all have in common is that like Frankenstein's creation, each aircraft was "pieced" together; upgraded, modified, altered, and overhauled in an attempt to achieve a different level of effectiveness. The only way to "evolve" an aircraft is to modify it and this is the primary reason people pursue either a field approval or in these cases, an STC. This is, inherently, a "good thing." In each of these scenarios the process of applying for and achieving an STC was followed in accordance with FAA regulations.

It is likely that, taken independently, no individual STC posed a threat. However, with the Cessna P210, the *layered* STCs — meaning the installation of an STC on an already modified aircraft — likely altered the airplane's spin susceptibility and recovery capability. A type-club representative of the Cessna 170 mishap stated that due to the differences in landing gear geometry of the two stock plane models from which the parts were taken, the maintenance manual from just one wouldn't be sufficient to guarantee the continued airworthiness of such a mixed configuration. For the Bell UH-1H helicopter, a fitting on the rotorcraft may have been fatigued during one STC initially which was then, in turn, further compromised during a second STC.

These incidents were not the direct result of any one maintenance action that was performed, but rather the result of two or more modifications that together potentially compromised the airworthiness of the aircraft. This makes pinpointing the *exact* moment when things go wrong that much more difficult.

Careful What You Modify

"I am practically industrious — painstaking, a workman to execute with perseverance and labour ..." – Robert Walton, Letter 2 (novel)

FAA Advisory Circular (AC) 43-210, Appendix 1, Item 9 states;

> *Previous Alterations or Repairs that May be Affected by This Alteration. Look at the aircraft and review its records to determine if there are any modifications, Supplemental Type Certificates (STC), alterations, or repairs that could cause a problem or conflict with the proposed alteration or repair ...*

This might be easier said than done. You might assume that the job of determining a "problem or conflict" is typically left to the FAA Aircraft Certification engineers who review and approve STC applications, but in truth there are an infinite number of modification possibilities for which a person might apply. It just isn't feasible for a representative to be able to account for every possible combination. Ultimately it comes down to the person you have commissioned to do the work on the aircraft (the installer), and you (the aircraft owner) to determine the interrelationship among multiple STCs.

This begins with the major alteration and repair application process. Appendix 1, Item 8 of the AC mentioned above, warns that "before completing the alteration or repair to your aircraft, [you must] be aware that after it has been altered or repaired, the aircraft must still meet its certification basis," and then requests documented proof — most typically given in the form of data. This might seem daunting, but your two biggest allies in getting the job done are patience (self-explanatory) and research (read on).

There are an infinite number of modification possibilities for which a person might apply, so it just isn't feasible for a representative to be able account for every possible combination.

Before you proceed to purchase an STC, first make sure you are clear about the desired outcome of the modification. Then consider everything the modification will affect within the existing system, even if it is a stock airplane, and *especially* if it has been previously altered. Identify what adding a new system could override in the previous system, what it might overlap with, and what it might complement. This process should be an active dialogue between the installer and the owner, and if the conversation starts to get a bit too "nebulous," that is the time to include a subject matter expert such as a designated engineering representative or the type manufacturer.

When dealing with surface or structure changes, an FAA engineer reviewing the paperwork will want to consider whether the change affects the structure, creates fatigue points, increases loads, or changes aerodynamics. For powerplant modifications, he or she will want to know how it will affect power output, change fuel consumption, or affect speed controls. For avionics or electrical compo-

nent STCs, you can be sure that aspects such as how the "boxes" integrate with one another and how much electrical power the system consumes will be scrutinized. Some key "catch-all" questions to consider are whether the change(s) alter gross weight, center of gravity, stability, or control. Any one (or more) of these categories could compromise the airworthiness of your aircraft should the STCs not be compatible.

To start identifying your needs, a great idea is to ask if the STC holder can give you some insight on what to expect of a post-modified aircraft, how they came to the decisions they reached — what ideas worked, and what didn't (and *why*). Next, ask your local FSDO representatives what they have been seeing out in the field as they might have more experience dealing with different types of modified aircraft. Lastly, seeking the advice of an experienced flight test pilot could also be very beneficial in determining interrelationship operability. This information, in conjunction with all the technical data you need for the individual STC itself, should get you on the right path to success.

Seeking the advice of an experienced flight test pilot could be very beneficial in determining interrelationship operability.

Getting Testy

"Forgive me, but I am forced to take unusual precautions." – Dr. Frankenstein (movie)

"[N]ever performed fatigue analysis;" "[no one] evaluated the individual or combined effects of the STC changes...;" "... not properly analyzed...;" and "... was not test flown/taxied for adverse effects... ." These are the common statements lifted from various mishap and post-incident reports in which multiple modifications were found to be suspect. Inspectors, investigators, and engineers involved in these cases believe that most of the design flaws and issues that presented at the onset of the mishaps could have been detected beforehand.

One example to illustrate this point — the P-51D *Galloping Ghost* mishap at the National Championship Air Races in Reno, Nev. — is also probably the most widely known in recent history. On September 16, 2011, after zooming through the air at speeds upwards of 440 knots, the P-51D suddenly rolled left and experienced a high-G pitch up. A few seconds later the left elevator trim tab departed the aircraft, rendering it uncontrollable and resulting in a crash into a seating area adjacent to the runway.

Investigation revealed that the former military aircraft

> *... [H]ad undergone many structural and flight control modifications that were undocumented and for which no flight testing or analysis had been performed to assess their effects on the airplane's structural strength, performance, or flight characteristics.*

The combined effects of the maintenance actions unfortunately rendered tragic results.

Obviously it is highly desirable to avoid such outcomes. So once you have decided on a course of action and launched the maintenance, the next step is to test, evaluate, record, and test again. Which brings us back to that test pilot mentioned earlier. This individual has been specially educated, trained, and credentialed to iron out the kinks and identify potential issues in new and modified aircraft — so why not use one to your advantage? If working with a test pilot just isn't feasible, then the next best bet is to put your newly modified aircraft through the paces, slowly, during a series of small test flights and preferably with a high-time pilot in the right seat (left is good too!).

When testing your modifications, remember that the primary goal is to ensure your aircraft is airworthy and safe to operate within its operational envelope. Another important goal is to make sure *you* know how to handle the new modifications prior to having to do it "for real." Once this has been established, all of the flight test operational and performance data needs to go into the aircraft's flight manual for future reference.

It's Alive! (now document it)

Sound recordkeeping is a critical part of owning and operating an aircraft and, at least theoretically, every decision you make is going to be based upon your historical data. This collection includes maintenance records, pilot operating handbooks, and logbooks. They should be carefully annotated so that you have a good solid ground to work from when the next big project comes along. Common documentation errors include inadequate descriptions of the work that has been performed, listing the wrong references, and incorrect life-limit annotations — all of which can prove to be costly when trying to establish a workable baseline.

Epilogue

"I will pioneer a new way, explore unknown powers, and unfold to the world the deepest mysteries of creation." – Dr. Frankenstein, Chapter 3 (novel)

As an owner/operator, one of the greatest joys is tinkering on, upgrading, refurbishing, or modifying your aircraft. I, for one, am all for it. New ideas and innovations help to extend the life and repurpose our existing general aviation fleet, while the latest and greatest technologies reflect in the new models coming off the assembly line. Absolutely, you should want to be a part of it. All that we ask is that you go about it the right way and in the best interest of safety, so that you and your "creation" can be around for many, many more happy flying years.

Sabrina Woods is an assistant editor for FAA Safety Briefing. *She spent 12 years as an aircraft maintenance officer and an aviation mishap investigator in the Air Force.*

For More Information

Designated Engineer Representative comprehensive list:
http://go.usa.gov/Kk55

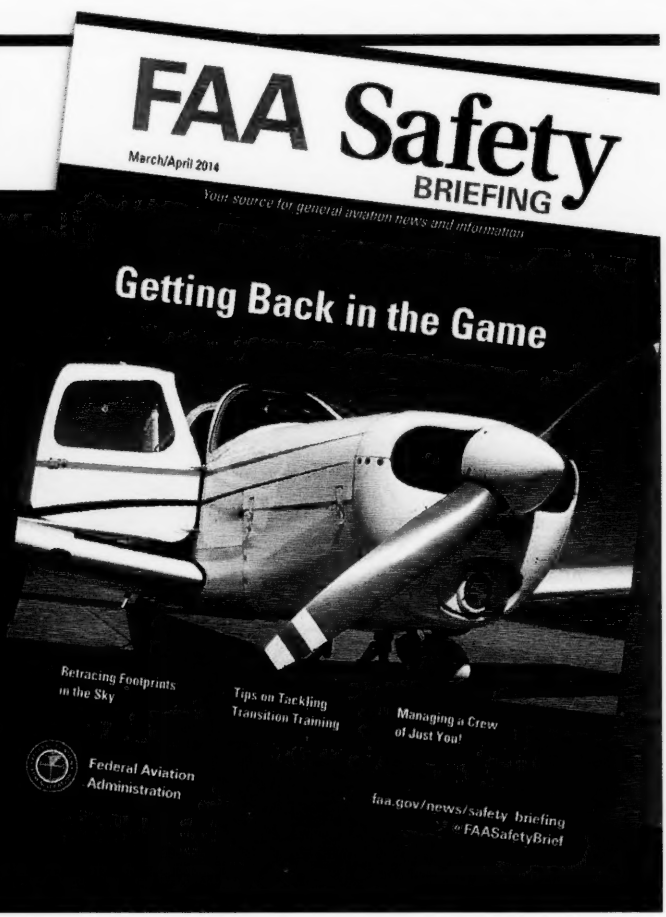
Special Airworthiness Information Bulletin CE-12-37, STC Modification Airworthiness Interrelationship Effects can be found here:
http://go.usa.gov/KWWP

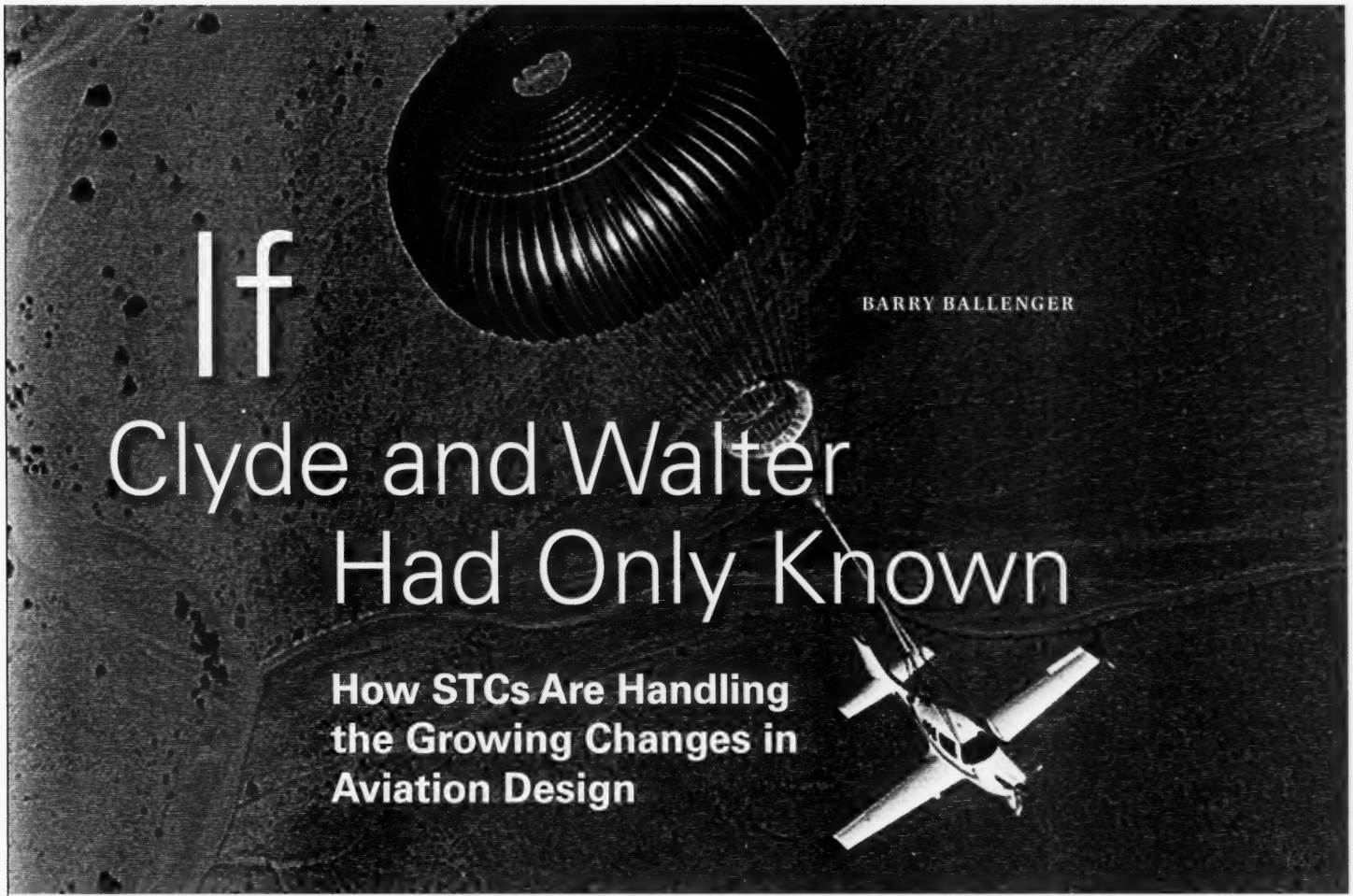
FAA AC 43-210, Standardized Procedures for Requesting Field Approval of Data, Major Alterations, and Repairs can be found here:
43-210: http://1.usa.gov/1jwmD8E

Subscribe Today!

FAA Safety Briefing is available as an annual subscription from the Government Printing Office. There are three ways to sign up today!

- By Internet at: http://go.usa.gov/4FSQ
- By contacting GPO toll free at: 1-866-512-1800
- Sign up for email updates at: www.faa.gov/news/safety_briefing/





If Clyde and Walter Had Only Known

How STCs Are Handling the Growing Changes in Aviation Design

BARRY BALLENGER

Photo courtesy of Cirrus Aircraft

An STC will allow you to install a Ballistic Recovery System on select aircraft

Don't know who Clyde and Walter are? We are speaking about Clyde Cessna and Walter Beech — two of the giants in general aviation history of course! And my, how these two gentlemen would marvel at how their creations are used today.

As general aviation began to mature to more than just recreational flying out of farm fields and grass strips, the industry began to take notice of how much the airplane could be used as a business and commercial tool. The airplane began to be seen as a legitimate solution to many business and commercial problems and so it began to morph from the standard cookie-cutter designs of the late 1950s and 1960s into a platform which could be modified to meet certain specialized tasks. These tasks included pipeline patrol, small cargo and passenger duty, fire control, and many others. Industry began to change the configuration of the standard design to meet specific job requirements and needs of the missions being conducted.

It was then the FAA recognized that the growing need for altering type designs would only accelerate. Many design changes were documented and approved under the field approval process, but as complexity and the effects of airplane operational performance measures grew larger, the process outgrew the field approval process. The field approval process was designed to make changes to one specific airplane with less formal documentation requirements. Today, most changes require a supplemental type certificate (STC).

The STC process approves major changes to the product's type design and requires more specific engineering documentation. It also may be effective for more than just one airplane. One unique aspect of the STC is that the STC design approval holder may sell the STC to others for installation on their airplanes if they qualify per the affectivity of the STC. The use of the STC process continues to grow in numbers and is becoming big business.

So How Do I Build a Better Plane?

What happens when you want to obtain an STC for a major change in type design to an airplane? The best place to start is the FAA's Advisory Circular 21-40A, *Guide for Obtaining a Supplemental Type Certificate*, found here: http://1.usa.gov/1hl343B.

The following discussion on the phases of an STC is for illustrative purposes; each project will take on its own flow and the steps may be not be exactly

the same each time, but typically the accomplishments will be very similar.

Phase I: Design and Requirements Definition

Some of the early steps include the applicant preparing the application and Certification Plan, as required by the FAA, and meeting with the Aircraft Certification Office (ACO). For first time applicants, it is recommended to set up a familiarization meeting with the ACO to discuss the proposed project and for the applicant to understand what the ACO is expecting from them. This allows the ACO the opportunity to determine what FAA resources may be required and to assist the applicant in understanding the STC process.

The FAA, in turn, will formally establish the project, review, and approve the Certification Plan.

One key component that must be considered by the applicant is compatibility of the proposed STC with the product on which it is being installed. As well, the installer of the STC on a specific airplane is responsible to perform a compatibility evaluation for that specific installation as stated in the limitations section of the STC. To read more about the risks of STC "layering" — that is, applying modifications to an aircraft that has already been previously modified, check out the article on page 12 of this edition of *FAA Safety Briefing*.

Phase II: Compliance Planning

This phase consists of determining how to perform the inspection and testing of the various components of the proposed design. Meetings between the ACO and the applicant will center on the certification plan and how it will be followed. Changes to the plan may be required to satisfy necessary requirements and to address issues discovered during this phase. The intent of the certification plan is to reach the point where if the plan is successfully executed, its results would show full compliance to all applicable rules.

At this point it is a good idea for the applicant to seek the help of a designated engineering representative (DER). DERs are fully qualified technical experts that are appointed to act on the behalf of the FAA and authorized to approve or recommend approval of technical data. Using designees allows the applicant to have more control over the schedule of the project.

The certification team should agree on the certification plan before commencing with conformity requests, approving test plans, witnessing or observing certification tests, or performing any other certification activities.

Photo by H. Dean Chamberlain

Phase III: Implementation

During this phase, work begins on the technical aspects of the proposed project. The applicant begins the process of showing compliance to the regulations through various types of tests, analyses, and evaluations for both ground and flight operations as needed. It is imperative the applicant's data shows compliance to all the necessary regulations applicable to the specific aircraft project.

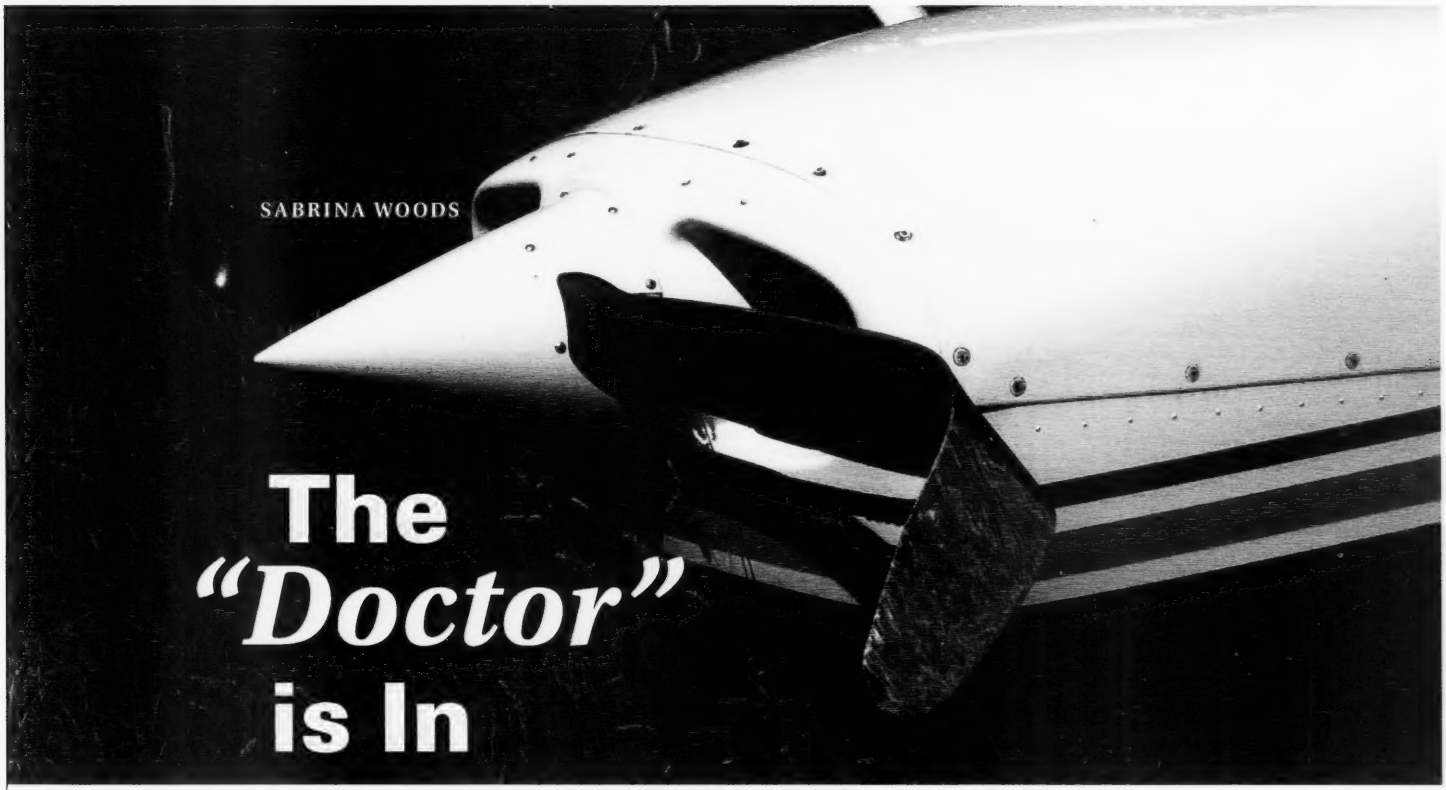
After all of the FAA compliance inspections and testing, the applicant submits the final data to the ACO project manager for final review and approval. If the ACO determines that the data demonstrates compliance with all applicable regulations, the final approval is granted to the applicant who now becomes the STC design approval holder.

Phase IV: Post Certification Activities

Once the STC is active in the field, post certification activities include monitoring continued operational safety by the STC holder. The STC holder is the entity primarily responsible for ensuring the STC remains safe in service. Also, the STC holder is responsible for any changes to the Instructions for Continued Airworthiness (ICA) or Aircraft Flight Manual Supplement (AFMS), if issues are discovered post certification.

As aviation continues to emerge as a dynamic business and commercial tool, the airplane itself will have to meet even more diverse expectations of what exactly is its primary purpose. As the need grows for more special-equipped airplanes to meet the demand, the STC will become more the "standard" than not. Changes to your aircraft can be a good thing, but with every modification we make we must make sure it is well researched, well documented, properly installed, and safe for flight.

Barry Ballenger is an aerospace engineer at the FAA Small Airplane Directorate in Kansas City, Missouri. He also holds an A&P with Inspection Authorization and is a private pilot.



SABRINA WOODS

The "Doctor" is In

A Short Guide to Who Should Fix Your Plane

The doctor is in. But *which* doctor do you need? If you are new to owning an aircraft, the aviation maintenance system might seem a bit daunting. Don't let that hold you back. Treating your aircraft is really no different than treating yourself. For example, you wouldn't go to an ear, nose, and throat doc when you have a sprained ankle. Likewise, you wouldn't bother with an orthopedic surgeon when you are feeling a touch fluish. Your plane's "ailment" will likely dictate which of the three options you go to for relief: airframe and powerplant mechanic (A&P), an inspection authorization endorsed mechanic (IA), or an FAA certificated repair station. Once you have a good understanding of what each category can provide, the rest is just triage.

Owner/Operator – (think: Vitamins and Immunizations)

Before we get into discussing the three options, I would be remiss if I failed to mention that there are several preventative measures that don't require the services of a certificated mechanic to accomplish. 14 CFR section 43.3 (g) states that, "the holder of a pilot certificate issued under part 61 may perform preventive maintenance on any aircraft owned or operated by that pilot which is not used under part 121, 129, or 135 ...." Holders of sport and light sport pilot certificates may perform preventive maintenance on a light-sport aircraft owned or operated by that pilot, as well, as this category does not require a rating for maintenance.

For type aircraft, the full list of what you can do for yourself is here: http://go.usa.gov/BmYG (Appendix A paragraph (c) 1-31). It includes tasks such as changing tires, servicing landing gear shock struts and wheel bearings, replacing cotter keys, replenishing fluids, and replacing spark plugs, light bulbs, or seat belts. However, before you grab the nearest ratchet set, wire cutters, and oil can and run out to your hangar, be aware that some seemingly easy jobs can get tricky, fast. If you have any questions or are at all uncertain as to what the task entails, it is always in your best interest to consult with an FAA certificated maintenance technician beforehand.

A&P – (think: Physicals and the Common Cold)

Okay, so there is no cure for the common cold, really, but you can certainly treat the symptoms. A&Ps are the people to go to for treating routine (but no less troublesome) ailments afflicting your aircraft. To become a 14 CFR part 65 certificated aircraft mechanic, one must be at least 18 years of age, read, write, and speak English, and acquire 18 months of practical experience for either airframe or powerplant certification, or 30 months of practical experience concurrently for both airframe and powerplant. A person can also complete the training by attending an accredited part 147 maintenance school. Then

come three tests (written, oral and practical) and voilà! A brand new technician is born.

But of course it doesn't stop there. It takes years of experience to become a seasoned aviation mechanic, and ultimately these are the people you're going to want to take care of your business. The "business" itself can range anywhere from examining engines, conducting 100-hour inspections, replacing and repairing defective parts, repairing minor structural damage, and corrosion control.

IA – (think: Routine Surgery and Broken Bones)

An A&P with the authorization to perform specialized inspections (e.g., annuals and progressive), and sign for an aircraft's return back to service after major repairs (Form 337), has the additional endorsement of "inspection authority" issued on a FAA Form 8310-5 (IA card). After becoming an A&P, earning this designation requires an additional three years of experience (two years active), having available equipment and a fixed base of operations, passing an inspection-specific written test, and meeting the rest of the requirements laid out in 14 CFR part 65.91. In order to renew their IA certification, an A&P must show specific evidence of maintenance activity, or attend refresher training courses in every odd numbered year.

In addition to the annual inspection, some more common tasks IAs sign off are the repair or replacement of spars, work done on major control surfaces, wing or tail surface brace struts, axle replacements, and any major repairs to the powerplant. It can be very beneficial if your A&P already has inspection authorization as an endorsement. That way you can get your work and paperwork done all at the same place. This can prove to be a time and money saver in the long run.

Repair Stations (think: Hip Replacements and Cardiovascular Surgery)

Should it come time for a "big fix" or a major overhaul on your aircraft, you might want to consider seeking out a repair station to do the work for you. Another, more colloquial term you might have heard is "MRO" which stands for maintenance, repair, and overhaul station.

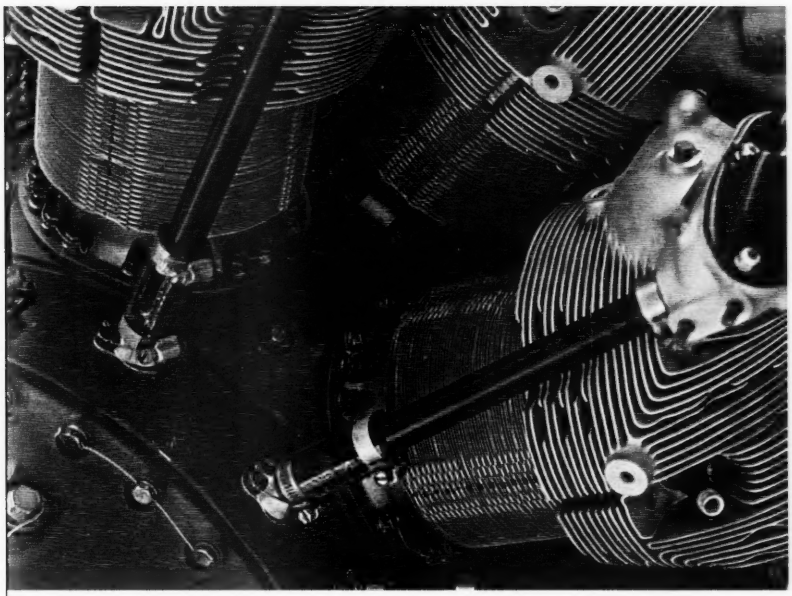
A station can provide the required specialized equipment, experience, and authorizations needed for complex processes such as avionics and electronics overhauls (i.e., NextGen), mechanical actuators, fuel systems, and carburetors. Services on large complex components such as retractable landing gear assemblies, reciprocating and turbine engines, and auxiliary power units might be too arduous and time consuming for the smaller, FBO-based maintenance facilities, so a repair station could very likely be your best bet.

Different stations might specialize in different segments of aircraft maintenance, and some are even type specific. All must adhere to the regulations and policies laid out in 14 CFR part 145. To obtain a repair station certification, an applicant must successfully complete a five-stage process. The stages consist of preapplication (a statement of intent the local FSDO or FAA designee uses to evaluate the complexity of the proposed operation), the formal application (applicants hand over all pertinent documents and interviews are conducted), document compliance (documents are reviewed to ensure conformity to applicable safety regulations), demonstration and inspection (proof that procedures are effective and meet regulations), and finally, certification.

Picking a mechanic can sometimes be a bit of a "chicken or the egg" scenario. You may not know who you need to see until your problem is fully diagnosed ... and in order to get a diagnosis, you need to determine who you are going to go see.

HMO vs. PPO?

Admittedly, picking a mechanic can sometimes be a bit of a "chicken or the egg" scenario. Often you aren't going to know who you need to see until your problem is fully diagnosed ... and in order to get a diagnosis, you need to determine who you are going to go see. But similar to a structured health plan for people, you can use one or any combination of options to sort out this dilemma.



Much like a health maintenance organization, you can pick the "primary care provider" for your aircraft and route all concerns through that individual, recognizing that you might have to get a "referral" to go somewhere else if the task is beyond his or her capability. You can also go the "preferred provider" route and see a different person each time to fulfill your maintenance needs. This latter option comes more into play when you already know something very specific you want done to your aircraft and you are going to take it to that "<insert specialty here> guy" people have been raving about.

When it comes to picking a good A&P, IA, or repair station, it is all about the research.

Whichever approach you choose, when it comes to picking a good A&P, IA, or repair station, it is all about the research. A great starting point is to ask around your FBO to see who your fellow aviators use. Ask your CFI or local FSDO representative if they know of someone they could recommend. Getting a mechanic who has experience in your type is also important so calling up the company or dealership to find out who they prefer can pay huge dividends.

Once you have a name, go check the place out. Make sure the work area looks well stocked, well organized, and that they have enough staffing for their work load. You will want to ensure that the location/person can handle most of your needs. It isn't convenient or cost-effective to take your aircraft to one facility to have an inspection done, another facility to have corrosion control or paint work done, and yet another to have avionics work done.

After you get the lay of the land, make sure you chat with the mechanic(s) as well. Personality and work ethic also come into play when picking the best person for the job. While some technicians work through aircraft issues analytically and are always up on the latest techniques, others seem to rely almost entirely on sage, savvy, and instinct. Choosing between these two could be as simple as the difference between owning a brand new Cirrus SR20, versus a vintage Cessna 140, respectively. You want to make sure they are compatible.

For a repair station, once you have selected one (http://av-info.faa.gov/repairstation.asp) you will want to check out the facility and make sure the shop has a valid FAA repair station certificate. Among the documents you should check out are the facility's operations specifications. These specifications should be displayed in the maintenance facility, most typically right next to the certificate. It should have capabilities suitable to your make, model, or type of aircraft and it is also a good idea to confirm the station has established an anti-drug and alcohol misuse prevention program.

Lastly, whether you choose an individual person, a team of people, or an entire shop, you will want to make sure they are communicative and attentive to you and your plane's needs. As the owner, you should be able to dictate the level in which you want to be kept in the loop, but keep in mind that once you have chosen your guy(s), giving them the latitude and space they need to address your problem will probably go a long way in keeping everyone happy.

So now that you know a little bit more about the maintenance process and all it entails, is it perhaps time to make an appointment? The doctor is in.

Sabrina Woods is an assistant editor for FAA Safety Briefing. *She spent 12 years as an aircraft maintenance officer and an aviation mishap investigator in the Air Force.*

Get **FAA Safety BRIEFING** news at your fingertips.
Follow us at ... **twitter.com/faasafetybrief**
or **@FAASafetyBrief**

SUSAN PARSON

When Less is a Whole Lot More

A few years ago, one of my flying club partners and I were preparing to launch the club's trusty Cessna 182 *Skylane* from our home airport in northern Virginia to the Tampa area, where we would base the bird while we enjoyed the annual festivities of Sun 'n Fun™. Being dutiful and safety-conscious pilots, we went to the computer and summoned a standard briefing from Flight Service. And then we commissioned the slaughter of at least a small spruce — not to mention the spillage of the chemicals composing that expensive ink — by hitting the "print" key. We then hauled the resulting "briefing" — a NYC telephone-directory-sized stack that was anything *but* "brief" — to a nearby table to figure out what mattered for our specific flight on this specific day. We felt a lot like prospectors panning for gold, sifting lots of rocks (e.g., volcanic activity in Montserrat) in search of a few nuggets of valuable information (e.g., the temporary air traffic control tower at our destination airport).

The NextGen Briefing

The good folks who work for Lockheed Martin Flight Service (LMFS) have been every bit as frustrated to deliver this kind of experience as the pilots have been to receive it. If anything, their frustration is even greater because they see it on a much larger scale. But they have been working to do something about it. Over the past few years, LMFS has been reaching out to pilots to get our unvarnished opinion about what works, what doesn't work, and what can be improved. They have been feeding that information into their overall research and development effort, and directing resources into service improvements that enhance safety, efficiency, and convenience.

One of the first changes was the pilot web portal, which has acquired over 10,000 registered users since its initial release in 2012. Sign-up is free — your tax dollars have already paid for the service — and you'll find lots of benefits waiting when you register.

Here's where the "less is a whole lot more" part comes in. When you enter a route, request a briefing, and choose the "NextGen" briefing option, the system gives you all the information available to Flight Service specialists. Phase I — rolled out in the fall of 2013 — provides both text and graphics for Terminal Aerodrome Forecasts (TAFs), Meteorological Aerodrome Reports (METARs), adverse conditions (e.g., Airmen's Meteorological Information (AIRMETs), and area forecasts. The NextGen approach uses color coding and dashed-line boxes to direct your attention to those items relevant to your particular route as you progress through it. Bringing up the TAF tab, for example, might give you six pages that show the weather conditions keyed to the expected progress of your flight. You can easily see how a 30-minute delay might make the difference between IFR and improvement to MVFR or VFR conditions.

That's all great stuff, but there's more to come this spring with the launch of Phase II. The element I am eagerly anticipating is the LMFS NextGen filtering of NOTAMs. Need I say more? But there is more — expanding integration with your favorite web service and app vendors, Adverse Condition Alerting Service, surveillance-enhances SAR capability, and an EasyActivate™/EasyClose™ VFR flight plan option that will soon be available through apps.

It's all there waiting for you — what are you waiting for?

Susan Parson (susan.parson@faa.gov, or @avi8rix for Twitter fans) is editor of FAA Safety Briefing. *She is an active general aviation pilot and flight instructor.*

Learn More

AOPA "Flight Service on Steroids" webinar (4 February 2014)
http://bit.ly/R60fcW

DAVID SHOWERS

All About ADs!

And How You Can Get Involved

One key concept in risk management is to base safety decisions on data, as much as possible, rather than relying on subjective judgment. The phrase "as much as possible" is important because this effort is often limited by the availability of data needed to assess risk. In other words, the more data the FAA has on a particular issue, the more accurately we can identify the risk associated with that issue, and the better safety decisions we can make.

The GA community plays a huge role in this by providing the information we need; it's what makes the risk management process effective. This is particularly true in the decision-making process for developing Airworthiness Directives (ADs). An AD is a legally enforceable regulation issued by the FAA in accordance with 14 CFR part 39 to correct an unsafe condition in a product that is likely to exist or develop in products of the same type decision. The information provided by the public can lead us to make the best possible safety decisions about what might (or might not) go into an AD.

But we could always use more information. If you have ever thought about getting involved in this capacity, there are a few great opportunities for you to do so. The Service Difficulty Reporting (SDR) system and the AD public comment process are two, and for small airplane issues, there is an additional chance to provide feedback through airworthiness concern sheets (ACS). All of these are important interfaces where your feedback can have a significant impact on FAA's assessment of safety issues.

When it comes to soliciting public input, Earl Lawrence, manager of the Small Airplane Directorate, emphasizes that, "By providing more feedback,

Photo by Tom Hoffmann

the public enables the FAA to provide more focused corrective actions or recommendations with fewer or less-restrictive ADs."

Need Da Info!

Information entered into the SDR system is reviewed by FAA engineers when evaluating potential safety issues. Information can be submitted (or reviewed) here: http://av-info.faa.gov/sdrx. Entering data into the SDR system does not necessarily mean the FAA will issue an AD. In fact, the SDR data can highlight service issues that can be caught early — during normal inspections — *before* they pose a significant safety impact. If we rely only on data that comes from accidents, we miss an important part of the safety story where issues are identified and addressed preemptively during normal maintenance.

When analyzing SDR data, there are two components of risk assessed in FAA's risk management process. The first is: What is the "likelihood" of the event occurring? This includes a look at the affected fleet size and the number of years/hours of service over which failures have occurred. The second is: What is the "severity" of the event? This one takes into account the outcome or result of the event. Engineers consider if there was an accident with injuries or damage to the aircraft, or if the issue was found during normal inspections.

Risk analysis methods applied by FAA engineers account for the severity of events by classifying them based on their outcome. Events that lead to injuries or significant damage to the aircraft are classified at higher levels of risk than those that do not. Most events do not cause injuries or significant damage, and FAA engineers consider this when evaluating risk.

However, they can only include events when they are aware of them. Such information may indicate that existing inspections are identifying issues before they reach a point where they impact safety. Bob Busto, a Continued Operational Safety manager at the Wichita Aircraft Certification Office emphasizes, "It is important for the public to know that FAA engineers consider *all* aspects of the information entered in the SDR system, including the final outcome."

SDR submitters often have valuable first-hand knowledge or insight that can help to better understand the nature of an issue. Some things to consider when inputting data are:

- What caused the problem?
- How it can be addressed?
- What was the result (outcome) of the service difficulty?
- What was the service history of affected parts (age, cycles, usage, environment, etc)?
- Are there any patterns the submitter has seen with other related service difficulties?

Being as specific as possible when inputting data can make all the difference in rendering the most positive outcome. The old adage "garbage in, garbage out" comes to mind here, so be careful what you input!

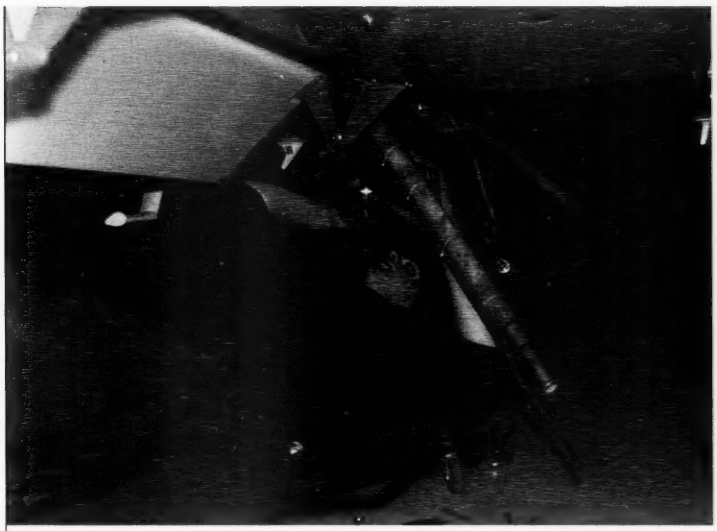
Another great way the GA community can get involved in the AD decision-making process is when the FAA issues airworthiness concern sheets for small airplanes. The ACS process takes place before the FAA initiates steps leading up to an AD for small airplane products, except in the case of emergency safety situations, which are very rare.

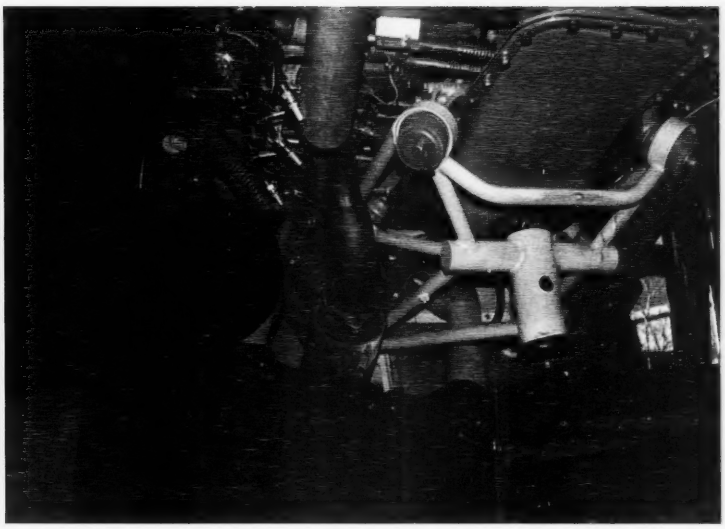
The FAA issues an ACS requesting feedback from the community, and distributes them to associations and organizations that can help reach an audience that may have valuable knowledge or experience related to the concern. Distribution includes aviation organizations/associations such as the Aircraft Owners and Pilots Association (AOPA) and Experimental Aircraft Association (EAA). ACS distribution also includes affected manufacturers, as well as type clubs for specific small airplane models. Type clubs are an important source for information as they provide an additional conduit to type-specific audiences with knowledge or experience germane to the potential safety concern.

Each of these organizations may handle the ACS distribution differently, and each may have a different approach to routing GA community feedback back to the FAA. In all cases, though, the common goal is to encourage the public to help the FAA make well informed safety decisions.

So Then What Happens?

The FAA's goal is to mandate ADs to address safety issues only when the level of risk is unacceptable, while avoiding mandatory corrective actions in situations where they are not warranted. In some cases, actions such as a special airworthiness information bulletins (SAIBs) may be more appropriate to raise public awareness of a concern, or to recommend voluntary actions. These SAIBs can be an effective means to address issues early before they rise to a level of risk that requires the mandatory corrective action of an AD.





Photos by Tom Hoffmann

The information provided to the FAA is considered by a panel of experts from multiple technical backgrounds, known as a Corrective Action Review Board (CARB). The CARB panel discussion is not unique to small airplane products; it is used for all aviation products. It includes engineers, inspectors, pilots, and managers, as needed, to provide thorough consideration of each issue.

The CARB considers all of the data available, to include pertinent SDR data, and, for small airplane issues, the feedback received through the ACS process. After discussing relevant information, the CARB makes recommendations about what actions to take. If they do recommend AD action, the recommendation is then processed through the appropriate offices and management personnel until a final decision is reached.

AD actions may be initiated as a "notice of proposed rulemaking (NPRM)" followed by a public comment period and eventually a final rule, if appropriate. In some cases, the risk assessment may lead us to issue an action as a "final rule; request for comments." This means the rule is effective prior to completing a comment period. In both cases, however, there is an opportunity for you to comment and the FAA must consider and address all public comments.

There are several ways to provide comments to AD actions (NPRM and "final rule; request for comments"). The first is to enter a comment directly into the docket by searching and locating the docket number on the Internet at www.regulations.gov and following the online instructions for submitting a comment. The public may also mail or hand deliver their comments for a specific AD action to the Docket Management Facility at U.S. Department of Transportation, Docket Operations, M 30, West Building Ground Floor, Room W12 140, 1200 New Jersey Avenue SE., Washington, DC 20590. Lastly, comments may be faxed to the Docket Management Facility using fax number (202) 493-2251.

Need an Example?

Circuit breaker switches serve as a great, recent example where information received through SDR reports and ACS feedback was an important factor in an FAA decision *not* to issue an AD. The data gathered helped to provide the FAA with a better understanding of the "severity" outcomes that resulted from different circuit breaker switch failure incidents. Previous mandatory AD actions addressed failures that caused smoke or fire in the cockpit and though there were continued SDR reports for circuit breaker switches, the reports indicated that the actions we had already taken to address the risk of smoke and fire were working.

ACS feedback for this issue was also very significant. In this example, the American Bonanza Society compiled 51 individual responses from its members and provided feedback to the FAA. Based on a combination of these responses and SDR reports, the agency determined the hazard associated with recent failures was a level of risk that did not yet warrant AD action.

Team Risk Management

It is important to note that FAA safety decisions are never made by just one individual. Whether through SDR reports, ACS feedback, or public comments to NPRMs/FRCs, public information about potential safety hazards is a valuable resource for the FAA, and ultimately for the GA community. We encourage everyone to take advantage of these opportunities to provide feedback. You are the ones with direct hands-on experience, and your insight is essential for us to make the best possible safety decisions. The more we know, the better we can reach our common goal of improving safety.

David Showers is the manager for the Continued Operational Safety Branch in the Small Airplane Directorate in Kansas City, Mo.

DAVE SIZOO

AOA: More than Just a Display

Real World Uses for Angle of Attack

AOA probe used on a Cessna 182 in FAA research program

Two Super Cubs departed the Anchorage, Alaska airport in formation just as the sun was coming over the horizon. It was a perfect day for flying and fishing. The 52-degree springtime air was crisp and the winds were calm as the airplanes headed toward their favorite secret fishing spot. Both pilots were looking forward to fishing after landing on the riverbank. Although they had flown to this spot many times before, this was their first trip this year.

As they approached the landing zone at about 350' above ground level, the first airplane spotted an extremely large moose crossing the river. The giant moose lumbered straight toward the middle of the landing zone. Instinctively, the pilot banked to the left for a better view of this amazing creature while simultaneously telling the trailing airplane of his find. As the two Cubs maneuvered across the circle from each other, the moose stopped in his tracks and lazily looked up.

The lead PA-18 pilot radioed, "This is the largest . . . " Suddenly, his airplane rolled to the right and ended up inverted. There was no time to recover.

Meanwhile, the pilot in the trailing Super Cub almost succumbed to the same trap. However, his airplane had some additional safety enhancements. He had an angle of attack (AOA) probe, an AOA indicator with audio, and an AOA-activated stick shaker. When he felt a rumble in the control stick and heard the stall warning audio, he knew something was not right. Glancing at the AOA indicator, he noticed he was in the red arc. He immediately relaxed backpressure and added full power while rolling wings level, but he was low and heading for the ground.

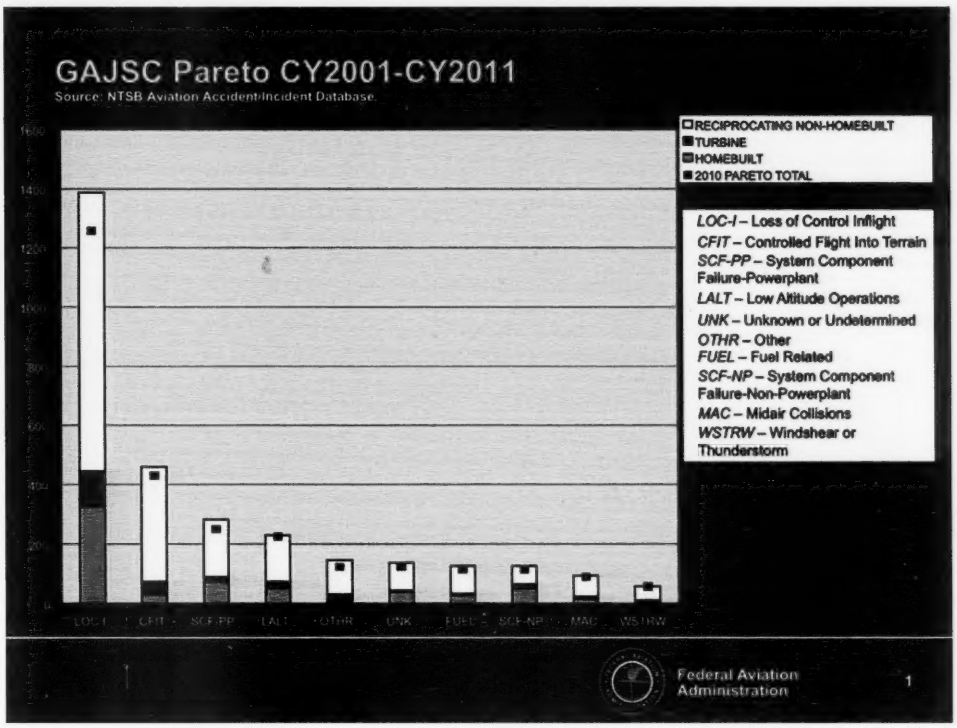
Looking forward, the pilot could see nothing but riverbank filling his windscreen. If he instinctively pulled back to avoid crashing, he would no doubt stall again. How hard could he pull without stalling? This was a max performance situation. His attention was now focused on where it needed to be — avoiding a secondary stall while minimizing altitude loss.

He loosened his clenched, reactive grip on the stick. Clearing the river by a few feet, he realized how close a call this was. As he climbed out, his heart was pounding. He gently banked to the left and craned his neck around to check on the lead airplane. His heart sank when he saw the pile of twisted metal and torn fabric burning on the riverbank. How could this happen to a mature 52-year old pilot with over 5,400 hours total time?

Although fictitious, this story illustrates an accident pattern that occurs all too frequently. In Alaska alone, over the last six years, there have been 97 accidents categorized as fatal or having caused serious injury. The most common of these was stall spin accidents, with 39 people killed and 26 people seriously injured. That's almost one person a month! This problem is not unique to Alaska. Loss of control is the leading cause for general aviation (GA) mishaps in the lower 48 as well, having caused 1,190 fatal accidents in the last 10 years. That works out to one fatal accident every three days on average. Clearly, this is a big problem, so let's have a look at how AOA indicators can assist pilots in preventing a loss of control situation and in recovering from a stall.

As pilots, we all should understand the theory of AOA and how important it is to safely maneuver

GAJSC/SAT Identifies Loss of Control In-Flight (LOC-I) as Leading Cause of Fatal GA Accidents (2001-2011)



our airplanes around the sky. We learned in ground school that an airplane will stall if you exceed the critical AOA. If aggravated, a stall can progress to a spin and/or loss of control. During flight training, we rely on airspeed to avoid a stall. However, it is important to keep in mind an airplane can stall at *any airspeed*, any pitch attitude, and any power setting.

If the pilot is expected to manage AOA to stay in control, why is this angle not displayed or utilized in the aircraft? AOA is displayed in most military fighters, many transport airplanes, and even in some small aircraft. However, AOA devices are not commonplace in GA. Thanks to a new FAA policy change, that may change.

In an effort to reduce both the GA accident rate and the cost of installing safety devices in airplanes, the Small Airplane Directorate started a campaign about three years ago. Collaborating with other FAA offices, the Directorate worked to streamline the time and money required to get AOA devices in the field.

The hardware itself for an AOA device is relatively inexpensive. New devices on the market accurately measure and display AOA. They also provide audio warnings as the critical angle is approached.

Speaking of affordability, how about a low cost aftermarket stick shaker activated from an AOA device? In recent flight tests conducted under an FAA Research and Development Project, this concept has proven very effective at getting the pilot's attention.

Now let's discuss the human factors of AOA devices. It is no wonder that pilots cannot manage AOA when it is not displayed to them. Displaying AOA is certainly a good start, but may not be enough. The pilot may not be looking at the display when he/she needs it the most. This is where getting his/her attention in another way is paramount.

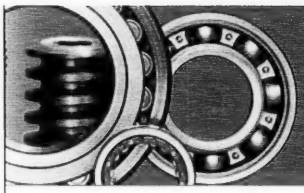
Invoking three of the five senses progressively with an AOA-based stick shaker, aural tone, and visual display should enhance the pilot's focus on what is important at the time. This approach may help address the root cause of many loss of control accidents — pilot error resulting from distraction.

To combat the Loss of Control issue, the FAA collaborated with industry and academia to form a Loss of Control Working Group. This group was under the General Aviation Joint Steering Committee Safety Analysis Team (GAJSC/SAT). The working group reviewed over 275 loss of control accidents and developed 98 specific interventions that would address the root cause of these accidents. Not surprisingly, AOA systems ranked first among these interventions in terms of feasibility and effectiveness.

When used properly, AOA can help pilots in many other ways. For example, AOA information can provide for a more consistent, stabilized approach and landing.

The Small Airplane Directorate is actively sponsoring multiple research programs with NASA, academia, and industry to explore additional benefits of AOA. This small but important angle is finally getting the attention it deserves in the general aviation world.

Dave Sizoo is a flight test pilot from the FAA's Small Airplane Directorate. *This article was originally published in August of 2012 in the Alaskan "Transponder" Magazine. It has been updated for inclusion in* FAA Safety Briefing. *Feel free to contact him at David.Sizoo@FAA.gov.*



SABRINA WOODS

The "Lighter" Side of Aircraft Maintenance

Light-sport aircraft (LSA) is probably the fastest growing group of aircraft in general aviation these days. These aircraft are dynamic, multi-framed, simple-to-operate, relatively inexpensive, and make an excellent option for those who wish to slip the surly bonds. Furthermore, there is great appeal in the fact that obtaining a sport pilot certificate requires fewer training hours than for a private pilot, and that medical eligibility comes in the form of a valid driver's license (unless having been previously denied, revoked, suspended, or found ineligible for an airman medical certificate). These aircraft were designed for those who want to fly just for the pure pleasure of it.

In its inception year, 170 sport aircraft were registered. The year after that the numbers increased to 1,273 and the year after that, the group exploded with an additional 4,793 registrations. Although relatively young — LSA is just ten years old — there are now over 9,000 active registrations between special (SLSA) and experimental (ELSA) certificates. The numbers have climbed steadily throughout the years and with every new aircraft registered, the need for light-sport aircraft maintenance also grows.

An LSA repairman certificate complements the certificates issued to airframe and powerplant mechanics and repair stations. If you are already an FAA certificated A&P, you don't need much more to get in on LSA maintenance action — just the class-appropriate tools and manuals to work, and for a repair station — the appropriate ratings. However, if you aren't a fully qualified A&P, you can still acquire an LSA repairman certificate. The bonus to this is that the hours you put in for one can be used to eventually obtain the other.

There are two ratings for LSA repairman: inspection and maintenance. An inspection rating (LSRI) allows you to accomplish the condition inspection on your own ELSA. The condition inspection is your once-a-year duty to check out the aircraft and ensure it is ready to meet the conditions of safe flight. It is performed in accordance with 14 CFR part 43, Appendix D. There is no rating for maintenance actions performed on experimental LSA. These are light-sport aircraft that you have assembled from a kit or purchased already built. However, the aircraft is still required to be kept in a condition for safe operation.

The LSA repairman certificate with a maintenance rating (LSRM) allows you to perform maintenance and inspections on SLSA and the condition inspections on an ESLA for hire or for compensation. This is, admittedly, the exact opposite of an A&P certificate where an inspection authorization (IA) endorsement is a more advanced credential.

The path to earning an LSA repairman certificate starts with being at least 18 years of age, being able to speak, read, write, and understand English, being a U.S. citizen or lawful permanent resident, and completing a 16-hour condition inspection "how-to" course for just the inspection rating. To get the additional maintenance rating you must attend a class-specific, FAA accepted course that will provide instruction in accordance with 14 CFR part 65.107 (http://go.usa.gov/BuT4). Course lengths vary by aircraft class with airplane privileges being the longest at 120 hours, weight-shift control aircraft and powered parachute taking 104 hours, and lighter-than-air and glider taking only 80 hours.

To find a training course, check out the light-sport page on http://1.usa.gov/14MhIeM, and from there click on the "light-sport repairman training providers and courses" link, which can also be found here: go.usa.gov/BSd3. You can also do an internet search to find one closest to your area. The link provides a couple of options, but wherever you eventually decide to go, make sure it is an FAA accepted provider. It is also a good idea to make sure the school can provide the training to meet your specific needs.

Once you have earned your LSA repairman certificate there are no renewal requirements and no limits on how many class privileges you may obtain. It is always a great idea to stay up on the latest developments in aviation maintenance, though. You can do this by reaching out to the manufacturers of your equipment or your aircraft — these companies tend to be pretty eager to show off the latest developments — or you can take a few online courses from the maintenance hangar section of FAAsafety.gov.

The light-sport aircraft "movement" is exciting, fun-loving, and more popular than ever. It fills the niche between the simpler ultra light aircraft, and the heavier types typically marked for transport. By learning to maintain LSA you can ensure your place in the future of recreational general aviation.

TOM HOFFMANN

The Alpha (and Omega)

How a Small Angle Can Make a Huge Difference

Unlike some of my classmates at the time, I actually have some fairly fond memories of high school geometry. In particular, I enjoyed breaking out the compass and protractor to measure, draw, and dissect angles. Long ago familiar terms like transversal, supplementary, complementary, and alternate-exterior are fun to rehash in my mind. Lucky for me geometry followed me into my flying career and become an important element to understanding aerodynamics and unlocking some of the mysteries of flight. Wing dihedral, angle of incidence, and the effect of aerodynamic forces are all examples of how geometric principles govern the way we fly. Then there's the "alpha" angle — the all-important angle of attack which every student pilot learns early on is an aerodynamic threshold that deserves the utmost respect.

Simply put, the angle of attack is the angle between an aircraft's wing and the oncoming air. If this angle becomes too great in flight, the wing will be unable to produce lift and the aircraft will stall. Not good. Most general aviation pilots rely on airspeed and the piercing whine of the stall warning horn to avoid getting themselves into a stall situation. However, another stall warning device that has long been available — but not without a sizeable effort and cost to install — is the angle of attack (AOA) indicator.

These supplementary devices are designed to alert pilots of a high angle-of-attack condition before a stall occurs, either with a visual or aural warning, or both. AOA systems provide an added layer of safety due to a more reliable indication of airflow towards the wing than an airspeed indicator can provide, regardless of gross weight, G-loading, or turbulence. And now, thanks to a revised FAA policy for producing and installing these devices, there's good news for those who were previously put off by the prohibitive cost and red tape.

So what's changed for AOA installations? Under the new policy announced February 5, 2014, manufacturers can now build the AOA indicator system according to standards from the American Society for Testing and Materials (ASTM). They then apply for FAA approval for the design via a letter certifying that the equipment meets ASTM standards and was produced under required quality systems. That means manufacturers no longer have to go through the full Technical Standard Order certification process to have an AOA device approved. The FAA's Chicago Aircraft Certification Office will process all applications to ensure consistent interpretation of the policy.

"This represents a drastic change for the FAA," says Craig Holmes, Aviation Safety Inspector with FAA's Aircraft Certification Service, referring to the manner in which this new streamlined policy was implemented. "The new guidance will allow us to significantly speed up the application and approval process and should help encourage owners to equip their aircraft with this important safety device."

There are a few important items to keep in mind with this new policy, however. First, it applies only to supplemental AOA systems — not those required for type certification of the aircraft. Second, it is limited to those systems installed in U.S.-registered aircraft, excluding commuter and transport category airplanes. The guidance also stipulates that no operational credit can be taken for such items as reduced approach speeds and shorter landing distances.

While the use of AOA systems is an effective means of reducing loss of control accidents, their effectiveness can be limited by how much proficiency an operator has gained with a particular device.

"Given the lack of available training on certain AOA systems, I recommend going up with a qualified instructor and testing it out thoroughly," says Holmes. "With an instructor by your side, you'll be able to monitor precisely how your AOA device reacts during stalls and other maneuvers."

Regardless of your take on geometry, I'm sure you'll appreciate the FAA's new "angle" on improving safety for GA.

Tom Hoffmann is the managing editor of FAA Safety Briefing. *He is a commercial pilot and holds an A&P certificate.*

Learn More

Approval of Non-Required Angle of Attack (AOA) Indicator Systems
http://1.usa.gov/1kNTZiT

FAA Press Release - Installation of Angle of Attack Indicators in Small Aircraft
http://1.usa.gov/1sGpW21

JAMES VIOLA

Vertically Speaking – Land and Live

It's no secret that the FAA would like to see a dramatic improvement in the safety record of helicopter operations. But beyond our internal goals and metrics I personally would like to see that same improvement. As a fixed wing and helicopter pilot I understand the difference between both the operations of and the risks faced by each category. Helicopters tend to operate in a more dynamic environment than the average GA aircraft. Therefore they face different, and in many cases a more dangerous set of risk factors. That's why I wanted to use this space to update you on a number of things FAA, NTSB, and industry are doing to help mitigate those risks.

Land and Live

One of the biggest safety initiatives that is going on right now is the Helicopter Association International's (HAI), Land and Live campaign in conjunction with the FAA. This program is intended to encourage helicopter pilots to exercise one of their most powerful and yet underutilized tools — the ability to stop and land vertically. Believe me; I understand this is not a part of our normal thinking.

I was happy to be working with HAI on a program we believe could have a big impact on helicopter flight safety. HAI president Matt Zuccaro highlighted a number of issues in the helicopter community that could cause pilots not to consider a precautionary landing. From fear of FAA action and angering their management, to creating fear in their passenger's minds. On the first point let me say this: If it's a 50-50 call, the FAA would prefer that the pilot-in-command weigh the information available and land the helicopter anywhere it can be done safely. We're working to educate our inspector work force on this policy, so please do me a favor and educate your colleagues as well. This is a big culture shift and it will require the efforts of not only the FAA and HAI but also those of you out in the community.

Could a precautionary landing lead to a few headaches? Sure, but the statistics of continued flight into adverse conditions make for very grim reading. So the real question is would you rather have to explain your actions to your boss, passengers, the FAA, and possibly local law enforcement, or have NTSB investigators and FAA inspectors try and guess at them later? Bottom line, when it's appropriate and safe, "Land and Live."

NTSB Safety Alerts

Another item I wanted to bring to your attention was that the NTSB has recently issued two new safety alerts dealing with helicopter operations. The first alert is Safety Through Helicopter Simulators (http://1.usa.gov/1kvpbYi). Based on numerous accidents they investigated, the NTSB feels that improperly performed emergency procedures are an accident cause that can be difficult to address in training. While pilots do practice procedures in the aircraft, safety considerations and aircraft limitations often reduce the fidelity of that training and therefore its efficacy. It is also challenging to recreate the element of surprise in realistic, complex scenarios without putting pilots in harm's way.

The NTSB recommends simulator training to practice emergency and abnormal procedures in demanding environments where such practice is most needed. Autorotations and inadvertent IMC encounters are just two of many circumstances that benefit massively from repetitive training but are

hard to simulate safely. The NTSB also recommends using simulators to create scenario-based training tailored to the operator's specific mission including NVG use in low-light and site specific procedures.

The second alert, Helicopter Safety Starts in the Hangar (http://1.usa.gov/1hZL2ps), focuses more on maintenance. Because of the complexity of helicopter design and operation, proper maintenance and inspections are critical. The NTSB document highlights a lack of vigilance in performing maintenance tasks or in verifying that the work was done correctly. A single missing screw or degraded component can have fatal results. The NTSB cites three different accidents in which there were eight fatalities to illustrate this point.

If it's a 50-50 call, the FAA would prefer that the pilot in command weigh the information available and land the helicopter anywhere it can be done safely.

The NTSB recommends that AMTs receive adequate training for any job they may be require to perform and to always refer to work cards and reference materials when performing those jobs. It is also important to document all completed maintenance steps. Additionally, it is recommended that AMTs obtain independent inspections of critical items that have undergone maintenance.

As a pilot you should make sure you understand the maintenance state of your aircraft. When possible you should make a review of the aircraft logs a part of your preflight. This might not be practical in every instance but when it is possible it can direct your preflight to the areas that need it most.

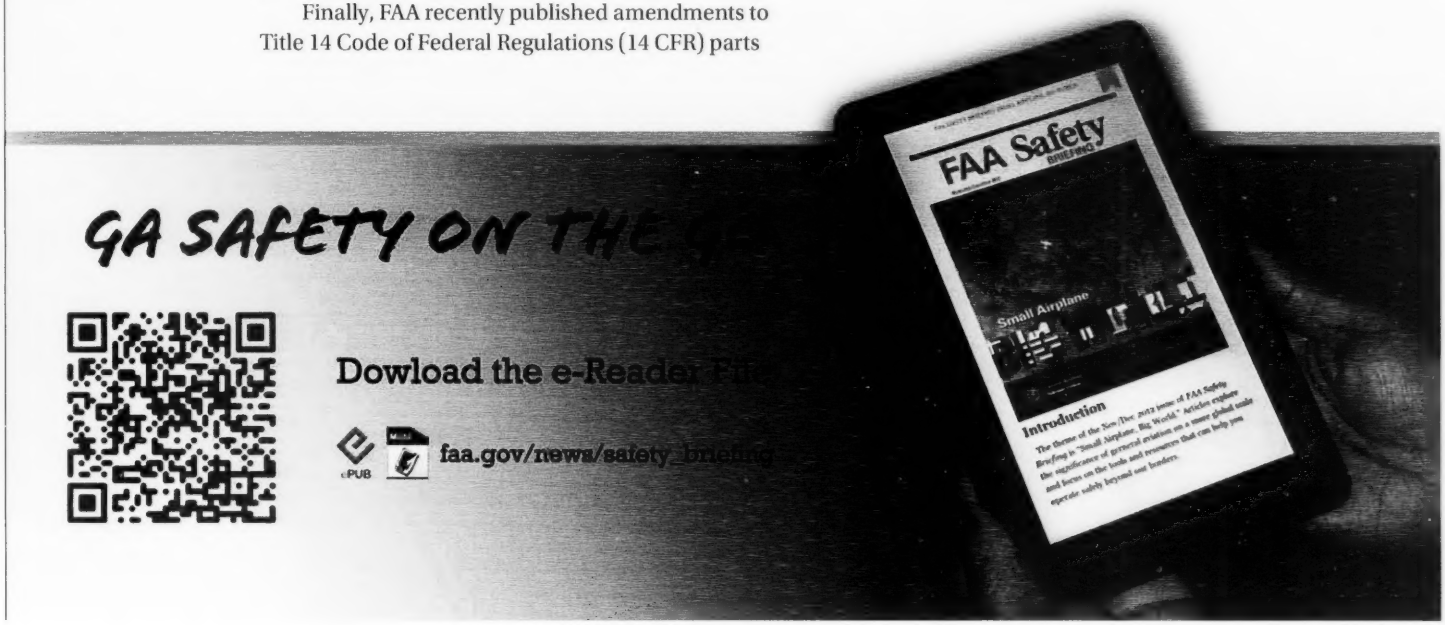
FAA Rule Change

Finally, FAA recently published amendments to Title 14 Code of Federal Regulations (14 CFR) parts 91, 120, and 135 to enhance helicopter safety. The changes are a mix of new operational procedures and additional safety equipment requirements. The new rule also revises pilot testing, alternate airports, and weather minimums. These changes weren't made lightly, but rather in response to an increase in fatal helicopter accidents, particularly in the air ambulance community. For more information on the rule change please visit: http://1.usa.gov/1fC8F0h.

We at the FAA realize that we can't solve these problems on our own. That's why we need your help. We need everyone in the helicopter community to commit to working in a professional manner. From the pilots in the cockpit to the AMT on the shop floor, each has a critical role and each role can be enhanced by a focus on professionalism.

But we also need your help in getting the message out. By reading these words you've already shown you are safety-minded. We need you to help us lead a major culture change that can hopefully lead to fewer accidents and fewer lost lives. The only way to do that is to work together. Can you think of some other changes that might help? Please let us know.

James Viola is the manager of the General Aviation and Commercial Division of the FAA's Flight Standards Service. He holds Airline Transport and Flight Instructor Certificates for airplanes and helicopters. He is qualified in a variety of helicopters from the Robinson R-22 to the Boeing MH-47 Chinook and has also flown more than 30 single and multi-engine airplanes.



Flight Forum

(Lost) Art Appreciation

I was really taken with the article "The (Lost) Art of Paying Attention." I'm an old pilot working to scrape the rust off my certificate after a 10-year lay-off and working with a great instructor in a Cirrus SR22 ...

— Curt

So well written. It's an excellent article highlighting a very real and ever increasing problem. As you are aware, it's not limited to the flight deck. As a private pilot and air traffic controller in the center, I recognize a number of the challenges you identified in the ATC environment ...

— Bryan

Excellent article! Too many pilots are hypnotized by "gizmo idolatry ..."

— Douglas

This is must reading and I intend to make sure all of my clients and students have read it. Further, I will make it a topic during the 2014 upcoming Cirrus Pilot Proficiency ground topics ...

— Cliff

"The (Lost) Art of Paying Attention" in the Jan/Feb, 2014 edition of FAA Safety Briefing *has resonated with so many of our readers that we decided to put just a few snippets here to highlight what people are saying. It is always our hope that our articles help to raise awareness and encourage a safety conscious culture. It is a pleasure to hear when we have succeeded in our goals. Thank you to all who wrote in.*

Turn the "Light" On

How can I get the specific requirements for an LSA license? I have only been able to find general information on the FAA website.

— David

The following link might be helpful in seeking a Sport Pilot Certificate: http://1.usa.gov/1i57fAh

Once there, the Sport Pilot Brochure link has a really good checklist for what is required for this certificate and also has point of contact information. You would also need to submit an application, FAA Form 8710-11, which can be found here: http://1.usa.gov/1qy3qo3 and the instructions are also on the same webpage under Proficiency Check Procedures for Obtaining Additional Category/Class Sport.

Kudos from Within

Thank you so much for the article "Our Finest Hour" (November/December 2013 edition) and providing an easy to follow reference on how the FAA supports with respect to a specific incident most folks are familiar with. Here at Mike Monroney Aeronautical Center we host the AVS data center, Airman and Aircraft Records, NOTAMs and provide other support to the FAA. I am proud of what we do and your article is very helpful for sharing with others. Thanks again as it was one of the best articles I have read in the FAA Safety magazine.

— Danny

We are glad you found it useful! It was fun to write about the FAA and the Cactus 1549 incident is a terrific example of how the work performed by various parts of the FAA came together for a good end. Like you, we are proud of what we do and glad we had a chance to showcase some of our work.

FAA Safety Briefing welcomes comments. We may edit letters for style and/or length. If we have more than one letter on a topic, we will select a representative letter to publish. Because of publishing schedule, responses may not appear for several issues. While we do not print anonymous letters, we will withhold names or send personal replies upon request. If you have a concern with an immediate FAA operational issue, contact your local Flight Standards District Office or air traffic facility. Send letters to: Editor, *FAA Safety Briefing*, AFS-805, 800 Independence Avenue, SW, Washington, DC 20591, or email SafetyBriefing@faa.gov.

Let us hear from you — comments, suggestions, and questions: email SafetyBriefing@faa.gov or use a smartphone QR reader to go "VFR-direct" to our mailbox.

SUSAN PARSON

Rx for Mx

I like to joke about aspiring to be a high maintenance female. Expensive, yes, but also fun, at least in my imagination. But I have no aspiration — none! — to have a high maintenance airplane. Expensive, definitely, and not just in my imagination. Therein lies a tale or two.

Time with the Trauma Team

For many years, my flying club's 1967 Cessna *Skylane* was mostly a low maintenance airplane, in the best sense of the term. We sent her to the FBO's maintenance shop for routine work (e.g., oil change) and periodic minor repairs. But then came disaster. The "big event" that most of us vividly remember occurred way back in the summer of '06, when one of our pilots had an unfortunate nocturnal landing encounter with a member of Bambi's tribe. The dastardly deer's decision to amble in the vicinity of the runway made a shambles of the *Skylane*'s horizontal tail. The damage rendered our poor airplane incapable of flight and urgently in need of a trip to the airplane equivalent of a major hospital trauma center.

As it happens, intensive care for airplanes carries the same kind of sticker shock as intensive care for humans.

I will never forget watching in horrified fascination (or was it fascinated horror?) as AMTs from that facility expertly removed first the fuel, followed by struts, wings, and horizontal tail. They fastened the fuselage to a crane. Then a fellow with a videogame-style joystick expertly jockeyed our stripped-down flightless bird onto the back of his flatbed trailer "ambulance." I still have the video I made to document the disassembly, and I'll always have the memory of watching it hauled out of sight.

After major surgery (replacement of several fuselage ribs and stringers along with the horizontal stabilizer and new rudder skin), some intensive care recovery time, and finally cosmetic repairs (a very spiffy new paint job), the *Skylane* was back in service and better than ever. I was — still am — incredibly grateful to the skilled AMTs who made my airplane whole again. I am also grateful for the insurance policy that covered the lion's share of this hugely expensive repair. As it happens, catastrophic injury intensive care for airplanes carries the same kind of sticker shock as intensive care for humans.

The Annus Horribilis

For about seven years after the *Skylane*'s major repair, we blithely cruised along with the bird requiring little more than routine feather-fluffing maintenance and occasional minor repairs.

Then came 2013.

January required the repair of a frozen roller flap. The "routine" annual inspection in February dragged into March, with a number of repairs (carburetor, ignition switch, induction crossover tube, etc.) and a much-needed but pricey refurbishment of the GNS 430. June brought the need to fix a mixture cable clamp and troubleshoot a persistent manifold pressure leak. August demanded repair of the tail and beacon light assemblies. October's expense was repair of a fuel bladder leak, and November's list included repair of the rudder trim bungee assembly, a fuel gauge repair, and replacement of both fuel cap gaskets. We finished the year with an expense for cylinder compression checks. And, in case you were wondering, by that time we had written maintenance and repair checks totaling close to $15,000. Ouch.

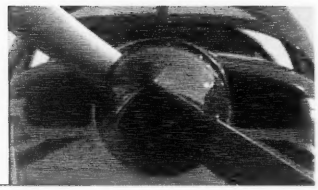
At this writing, the *Skylane* — like my boss's *Cherokee* — is undergoing its 2014 annual inspection. Here's hoping that both our birds emerge with squawk-free annuals, and fingers crossed that 2014 will be a maintenance *annus mirabilis*.

Susan Parson (susan.parson@faa.gov, or @avi8rix for Twitter fans) is editor of FAA Safety Briefing. *She is an active general aviation pilot and flight instructor.*

Photo by Susan Parson

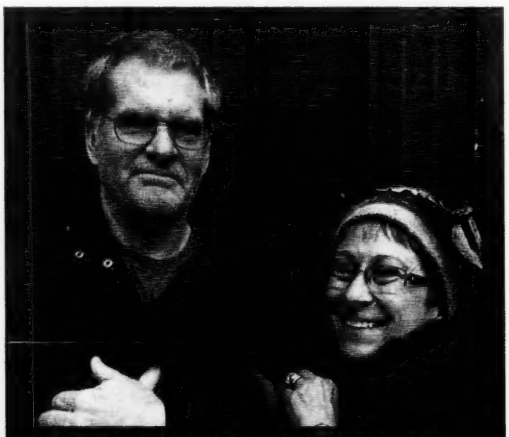
PAUL CIANCIOLO

FAA Faces



Craig Holmes

Aviation Safety Inspector, Airworthiness Certification Section



Pictured are Craig Holmes, his wife Tina, and a future sled dog on a recent visit near Denali National Park in Alaska.

What happens when a kid stumbles across someone welding together an airplane fuselage in an old barn? He wants to build an airplane himself, of course! Before building one, though, Craig Holmes figured he should learn to fly an airplane. So, at age 16, he started flying lessons in Nebraska and earned his private pilot certificate the next summer.

"I never did start building that airplane," said Holmes. "My philosophy was that I wouldn't start building one unless I had the money in the bank to finish it."

Even though Holmes never built that plane, he has a knack for fixing things. During college, he was a one-man maintenance department at a local meat processing plant. He then joined the Army National Guard and was trained as a Bell UH-1 *Huey* helicopter mechanic. Several years later, he put that flight training to work and earned his helicopter scout pilot wings. Holmes also had the opportunity to fly a C-12R *Huron* — aka an "off-the-shelf" Beechcraft B200 *King Air* — for the Army around Europe. He then spent several years as a standardization instructor pilot at Fort Belvoir in Virginia.

Acting on advice from a fellow National Guardsman whose day job was working for the FAA as an aviation safety inspector (ASI), Holmes accepted a position in the agency as an ASI in general aviation operations. After spending some time in the Flight Standards Service's General Aviation and Commercial Division — the organizational home of this publication — Holmes took a job in the Aircraft Certification Service's Airworthiness Certification Section as a manufacturing ASI.

The section is responsible for establishing and maintaining rules and policies for the issuance of airworthiness certificates, and for the marking of aircraft and parts. An airworthiness certificate of some sort is required before any aircraft can fly in the National Airspace System (NAS). In a nutshell, Holmes' current office essentially touches everything that flies.

The entire Aircraft Certification Service may also be getting a makeover in the not-too-distant future.

Most notably, Holmes co-authored the FAA's new policy for a streamlined method of approving the design and production of supplemental angle-of-attack indicators.

"Industry asked for an alternative to the TSO [technical standard order] authorizations, and we developed this new policy, which we are implementing on a trial basis."

"We are also working on an automated system for applying for an airworthiness certificate," said Holmes. "This will automate the process of application for, and issuance of, the certificate. I believe it will really help people applying for a special flight permit."

The entire Aircraft Certification Service may also be getting a makeover in the not-too-distant future. Its current organizational structure is being evaluated with a view shifting from a geography-based service to one organized by core functionality.

"This kind of structure should allow us to respond to industry needs more quickly, and provide better service," notes Holmes.

With such a diverse aircraft fleet in general aviation, it's good to know that the agency has a dedicated team of FAA inspectors who, like Holmes, have a diverse background and plenty of enthusiasm for aviation.

Paul Cianciolo is an assistant editor and the social media lead for FAA Safety Briefing. *He is a U.S. Air Force veteran, and a rated aircrew member and search and rescue team leader with the Civil Air Patrol.*

U.S. Department
of Transportation

**Federal Aviation
Administration**

800 Independence Ave., S.W.
Washington, D.C. 20591

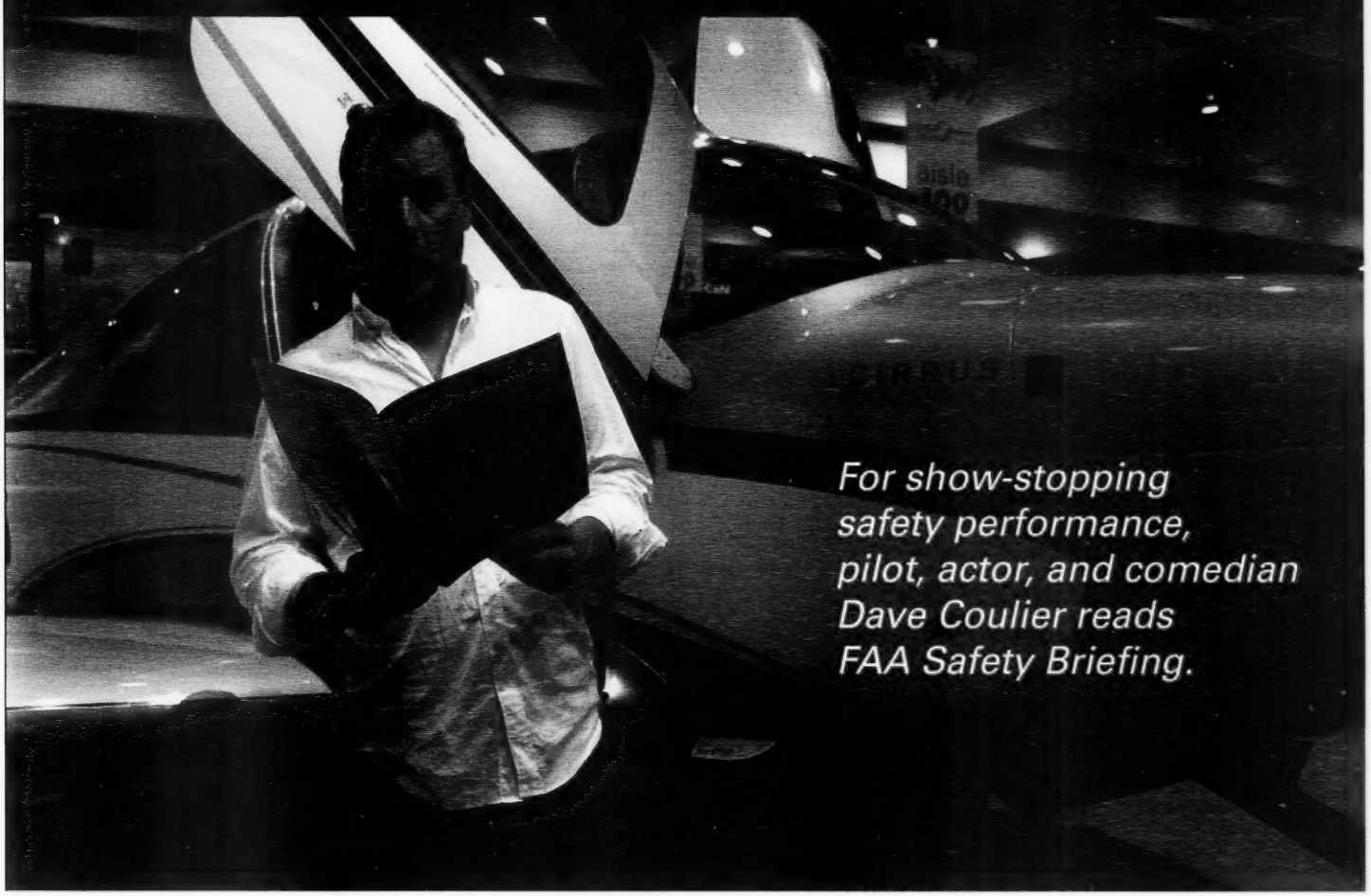
FORWARDING SERVICE REQUESTED

Official Business
Penalty for Private Use $300

faa.gov/news/safety_briefing

faa.gov/news/safety_briefing **@FAASafetyBrief**

Look Who's Reading FAA Safety Briefing



For show-stopping safety performance, pilot, actor, and comedian Dave Coulier reads FAA Safety Briefing.